SERVICE HANDBOOK

A.O.Smith
Water Heaters

Genesis®

Space Saving
Mid-Range Efficiency
Gas Boiler

MODELS COVERED

GW/GB 200 through 750

Series 200 through 203

Part No. 317919-000 • Printed in the U.S.A. • 0905

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Note: Each step assumes the successful completion of all prior steps.

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GENESIS HANDBOOK INTRODUCTION

This service handbook is designed to aid in servicing and troubleshooting A.O. Smith Genesis water heaters in the field. No duplication or reproduction of this book may be made without the express written authorization of the A.O. Smith Water Products Company.

The following text and illustrations will provide you with a step-by-step procedure to verify proper installation, operation, and troubleshooting procedures. Additional quick reference data is included to assist you in servicing this product.

The information contained in this handbook is designed to answer commonly faced situations encountered in the operation of the Genesis product line and is not meant to be all-inclusive. If you are experiencing a problem not covered in this handbook, please contact the A.O. Smith Customer Care Center at 1-800-527-1953 or your local A.O. Smith Water Products Company representative for further assistance. This handbook is intended for use by licensed plumbing professionals and reference should be made to the instructional manual accompanying the product. This handbook contains supplemental information to the Genesis instructional manual.

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Qualifications: Installation or service of this water heater requires the ability equivalent to that of a licensed tradesman in the field involved. Plumbing, air supply, venting, gas supply, and electrical skills are required.

Tools Required:

- powered screwdriver
- crosstip screwdriver
- a 7/16 inch open end wrench
- a set of marked drill bits
- an electrical multimeter tester capable of measuring continuity and voltage
- gas pressure gauge or manometer
- water pressure gauge
- draft gauge
- thermometer
- a 1/2 inch drive socket set (USA)
- wire terminals and appropriate tools if electrical repairs are to be made
- tube cleaning tool if copper tube(s) are to be delimed

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INSTALLATION

Note: Controls are accessible from the left end or top of the unit. The blower is accessible from the top. (The blower air shutter may be adjusted from the top, but the top cover does not need to be removed.) Burners, hot surface igniter and flame sensors are accessible from the front.

Interior Clearances to Combustibles

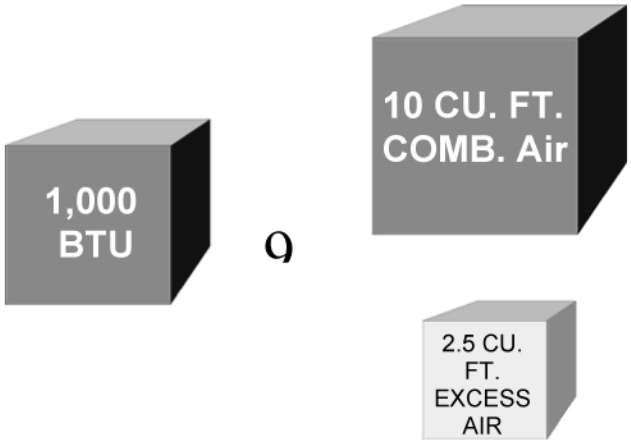
Genesis heaters are approved for installation on non-combustible flooring. They can be installed in an alcove with minimum clearances to combustibles of:

Minimum Clearances To Combustibles						
	Top	Water Side	Blank Side	Rear	Vent	Front
All Models	3" (76mm)	3" (76mm)	3" (76mm)	3" (76mm)	6" (152mm)	Alcove

An Optional "Combustible Floor Kit" is available.

Note: Approximately 30" is suggested as a service clearance to the front of the unit and 24" from ends of the unit. Also, sufficient clearance on the return bend end (blank side) is suggested to permit access to heat exchanger tubes for cleaning.

AIR FOR COMBUSTION



Complete combustion requires 10 cubic feet of air per 1000 BTUH gas input. The National Fuel Gas Code also recommends an additional 2.5 cu.ft. of "excess" air. This 12.5 cu.ft. minimum supply air per 1000 BTUH input applies to natural gas models. The National Fuel Gas Code also specifies minimum make-up air opening sizes for various building installations. (Ref: NFPA 54/ANSI Z223.1)

In calculating the free area of a vent opening, the blocking effect of screens, louvers and grills should be considered. Screens shall not be of a mesh smaller than ¼ inch square. If the free area is not known, the latest edition of National Fuel Gas Code ANSI Z223.1 recommends using figures of 20-25 percent free area for wood louvers or 60-75 percent for metal grills or louvers.

AIR FOR COMBUSTION

When installing the Genesis in an area of tight construction or within a “confined” air space (less than 50 cu. Ft. of volume per 1,000 BTUH of the total input rating of all appliances installed in that space), adequate combustion air must be supplied to the heater. The following information from NFPA 54, ANSI Z223.1, explains various methods of meeting the minimum air requirements for these installations.

Direct Communications

The Genesis is a category I appliance (non-positive vent static pressure and vent gas temperature that avoids excessive condensate production in the vent) when vented vertically non-direct. A category I appliance typically uses room air for combustion and exhausts through vertical piping or a chimney. Use standard “B” vent material.

A fresh supply of make-up air for combustion can be supplied to the heater through make-up openings, which directly communicate with the outdoors. Two openings are required – one commencing within 12 inches of the top of the enclosure and one commencing within 12 inches of the bottom of the enclosure. Each opening shall have a free area of not less than 1 square inch per 4000 BTUH of the total input of all appliances within the enclosure.

One permanent opening, commencing within 12 in. (30 cm.) of the top of the enclosure, shall be permitted where the equipment has clearances of at least 1 in. (2.5 cm.) from the sides and back and 6 in. (15 cm.) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces (crawl or attic) that freely communicate with the outdoors, and shall have a minimum free area of:

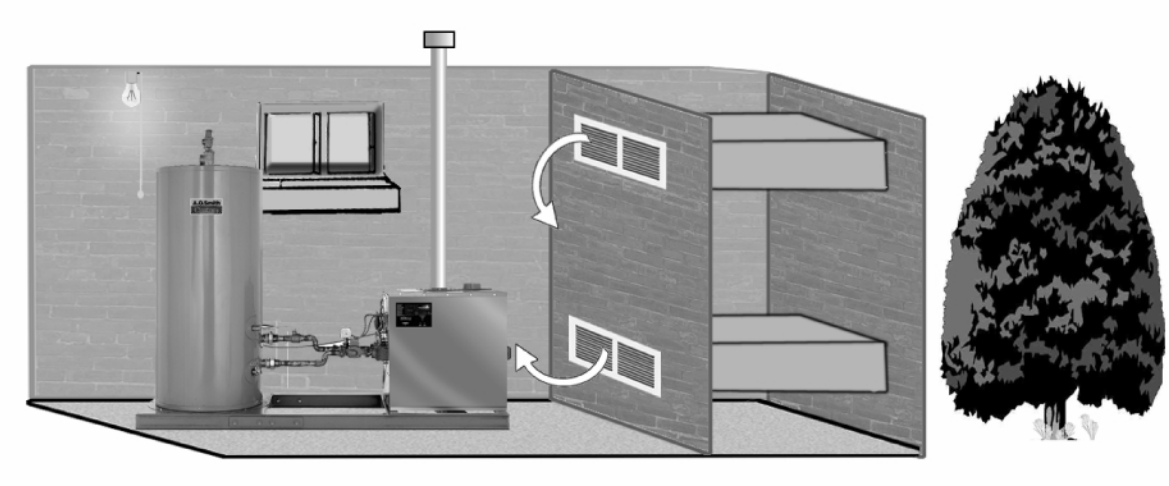
a. 1 sq. in per 3000 Btu per hr (7cm^2 per kW) of the total input rating of all equipment located in the enclosure, and
b. Not less than the sum of the areas of all vent connectors in the confined space.

VERTICAL DUCTS

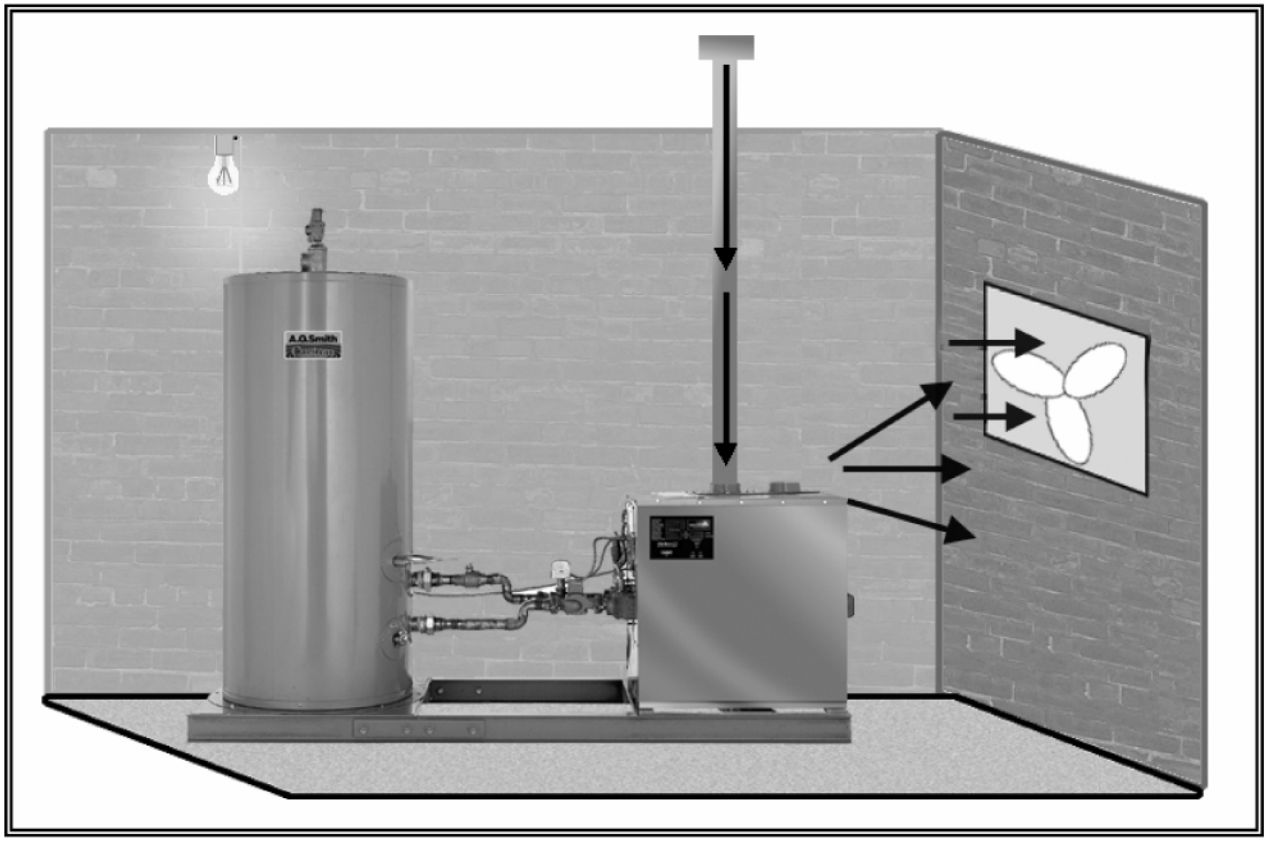
Often it is more practical to install vertical make-up air ducts to the outdoors. Again, two openings are required - one terminating within 12 inches of the top of the enclosure and one terminating within 12 inches of the bottom of the enclosure. Each opening shall have a free area of not less than 1 square inch per 4000 BTUH of the total input of all appliances within the enclosure.

HORIZONTAL DUCTS

When the heater is installed in an interior room with no roof access for vertical ducts, horizontal make-up air ducts should be installed. When using horizontal ducts, two openings are required - one within 12 inches of the top of the enclosure and one within twelve inches of the bottom of the enclosure. Each opening shall have a free area of not less than 1 square inch per 2000 BTUH of the total input of all appliances within the enclosure.



AIR FOR COMBUSTION
Downdraft



Insufficient make-up air is a major cause of combustion problems. One common example is a mechanical room where exhaust vent equipment was not considered in sizing make-up air requirements. This may result in air being pulled down the exhaust vent of the Genesis causing flue gas spillage, flame roll out, improper combustion, and/or erratic heater shut down. It can also cause the production of carbon monoxide that could result in serious personal injury or death. In order to assure proper operation, perform a worst case depressurization test as outlined on Appendix H of the National Fuel Gas Code (ANSI Z223.1/NFPA-54).

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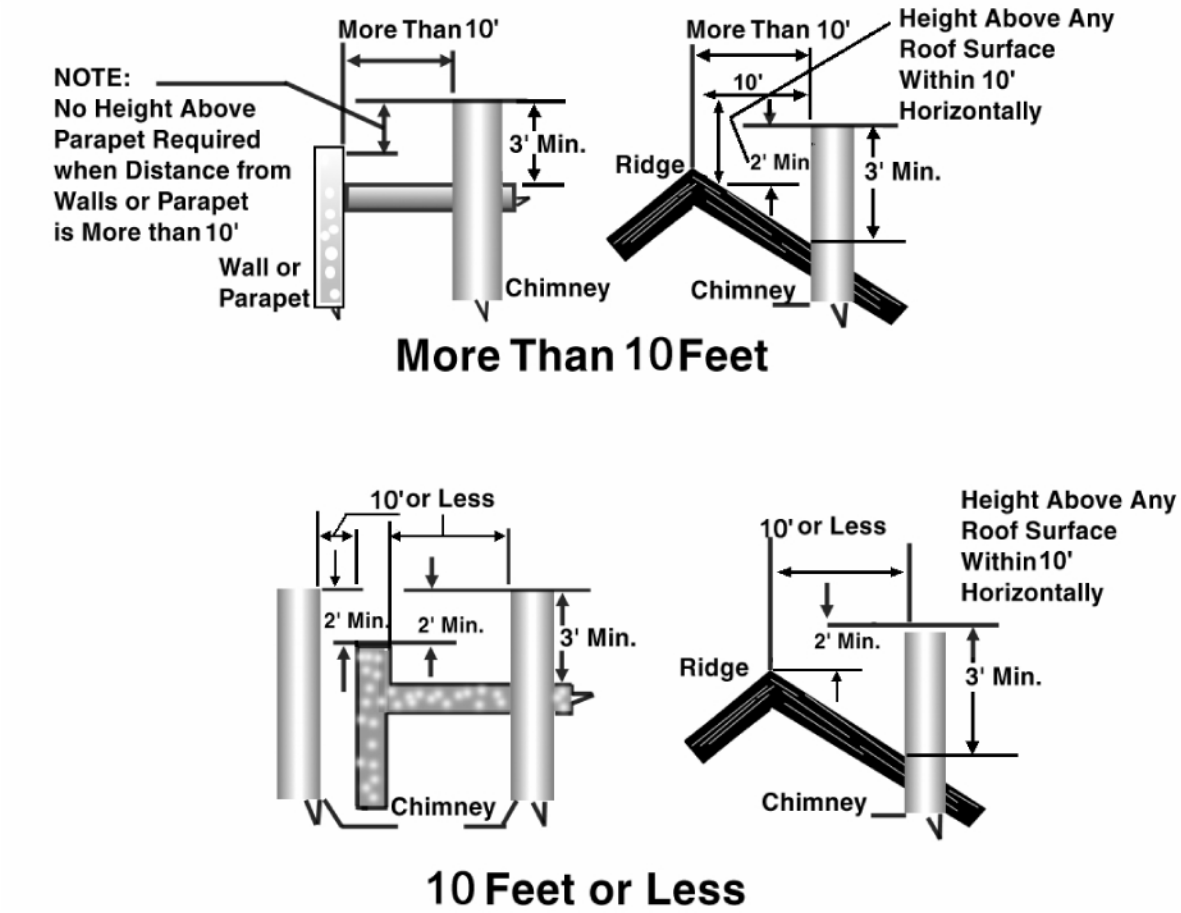
EXTERIOR VENT CLEARANCES



This illustrates the exterior roof clearances for Genesis unit with natural draft venting. A gas vent shall terminate above the roof surface with a listed cap or listed roof assembly. All other gas vents shall terminate not less than 3 ft (0.6 m) above the highest point where they pass through the roof and at least 2 ft (0.6 m) higher than any portion of a building within 10 ft. (3.1 m). (NFPA 54/ANSI Z223.1)

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When installed as a direct vent system, follow the manufacturer's recommended clearances.

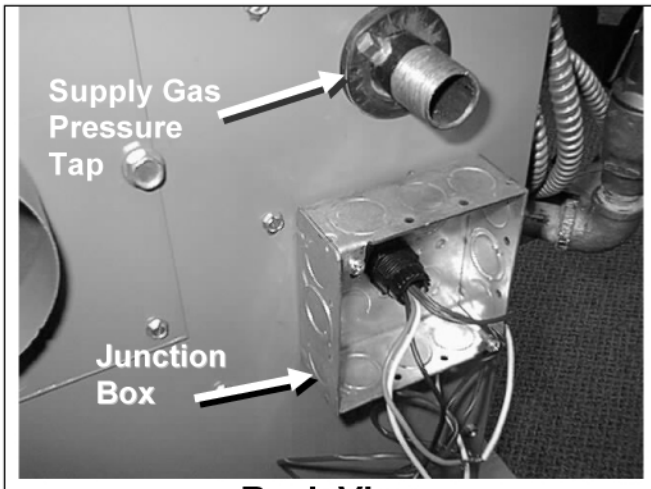
AIR FOR COMBUSTION
Contaminated Air

Along with an adequate volume of combustion air, the quality of the air is also important. Contaminants in combustion air can lead to premature heater failure. Vapors from bleaches, soaps, waxes, salts, etc. are drawn into the combustion chamber with the make-up air and, once fired, mix with water vapor in the gases to form extremely corrosive hydrochloric or hydrofluoric acid and other corrosive byproducts. A direct vent installation **does not** eliminate this concern.

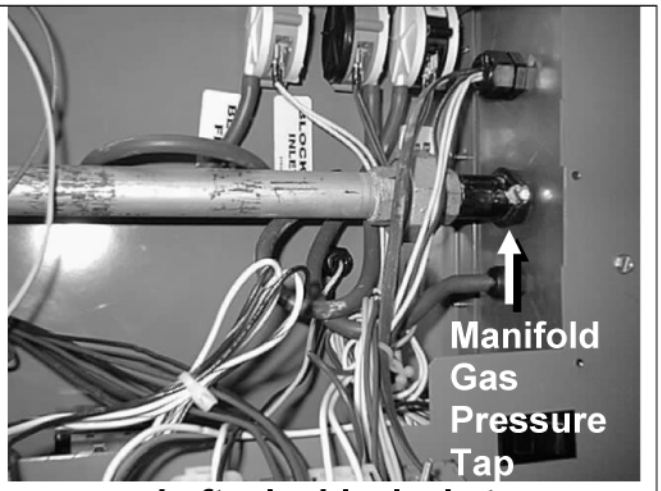
AIR FOR COMBUSTION
Flammable Items

Flammable items, pressurized containers or any other potentially hazardous articles must never be placed on or adjacent to the heater. Open containers of flammable material should not be stored or used in the same room with the heater. A direct vent installation **does not** eliminate this concern.

SUPPLY GAS PRESSURES
Genesis



Back View



Left – Inside Jacket

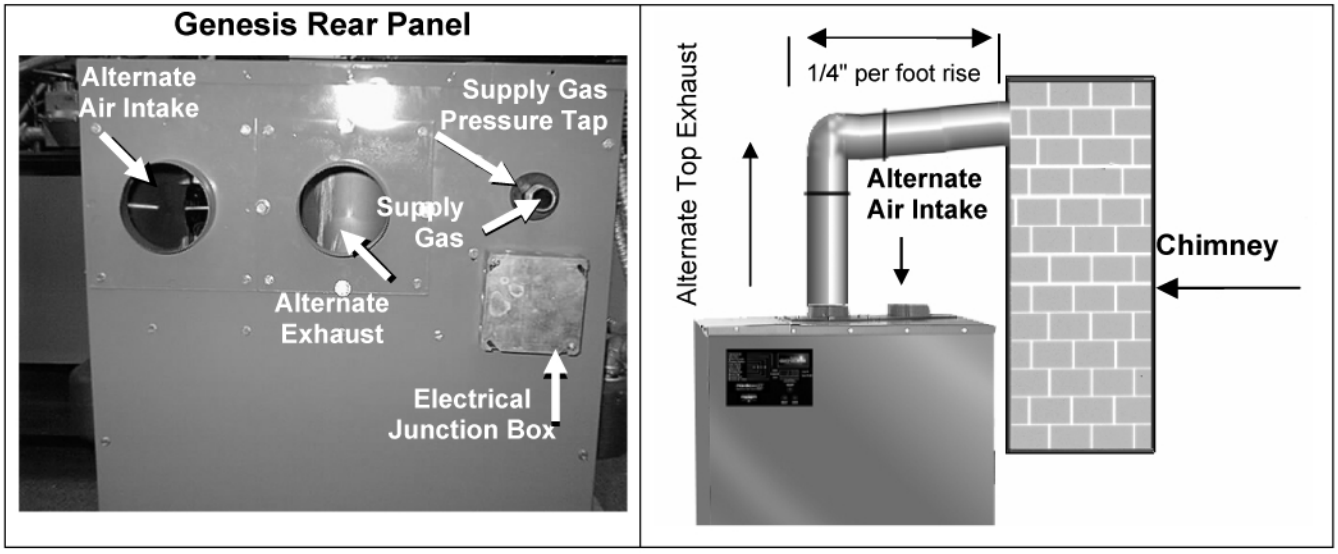
Supply Gas Pressure				Gas Type	Manifold Gas Pressure		Heater BTUH (1000)
Maximum		Minimum					
Inches w.c.	kPa	Inches W.C.	kPa		Inches W.C.	kPa	
13.8	3.49	4.5	1.22	Natural	3.5	0.87	200-750
13.8	3.49	11.0	2.74	Propane	10.0	2.49	200-750

The supply gas pressure is normally measured at the dirt leg or at the gas pressure tapping on the pipe nipple behind the rear jacket. This reading must be measured with 'flowing' gas.

The manifold gas pressure is measured at the manifold pressure tap located behind the manifold union when the gas is flowing.

See "Gas Connections" section of the installation and operation manual to verify proper gas supply piping installation.

VENTING



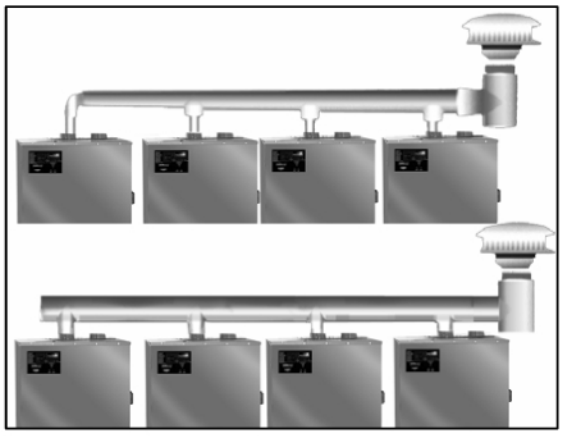
All Genesis water heaters are classified by ANSI as category I (non-condensing, negative pressure venting) appliances when exhaust vented vertically using room air for combustion. They are approved for type B vent.

The Genesis may be common vented only with other category I appliances. (See venting section in the National Fuel Gas Code). This illustrates a single unit connected to a chimney. A minimum of 1/4-inch rise per foot of the horizontal vent piping is required. When venting the Genesis boiler through an oversized chimney (including masonry chimneys), additional care must be exercised to assure proper draft. For proper operation, a minimum draft of –0.02" W.C. and a maximum draft of –0.04" W.C. must be maintained. In instances of excessive draft, **a barometric damper may be required** to assist in maintaining the proper draft. Draft should be measured 2 feet above the boiler vent collar.

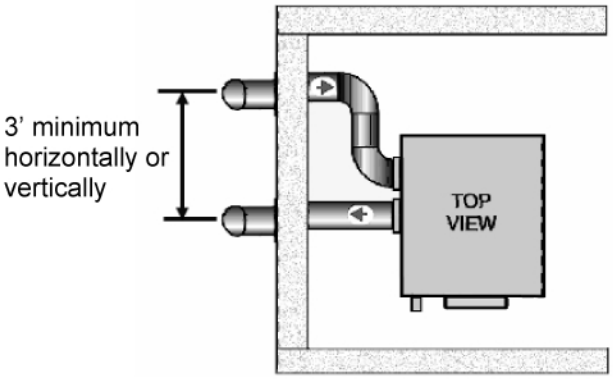
VENTING
Multiple Heaters

(When installed as a Category I Appliance)

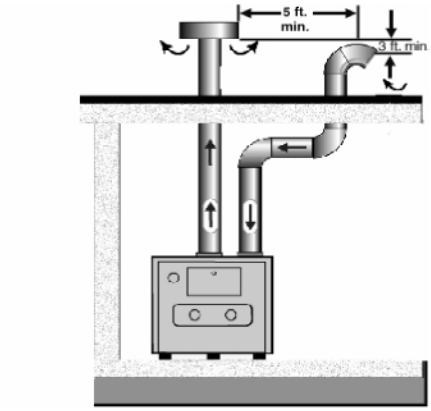
For larger applications, Genesis water heaters can be commonly vented together either in a tapered manifold or constant size manifold. (Follow National Fuel Gas Code requirements for sizing and installation.)



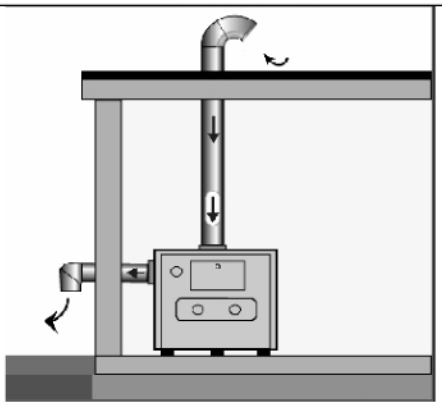
MULTI-VENTING CONFIGURATIONS



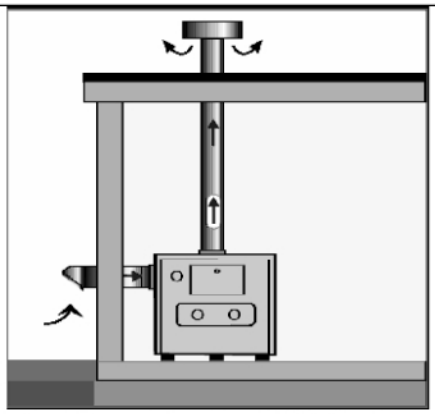
Horizontal Sidewall Direct Venting Rear Intake/Exhaust



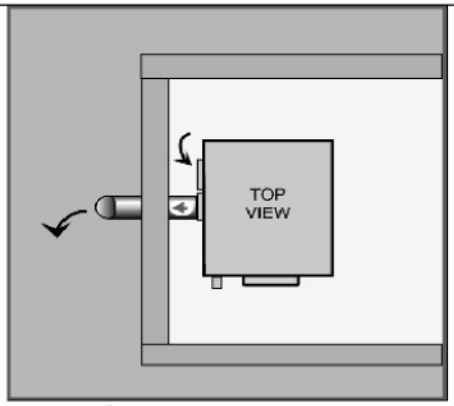
Vertical Direct Venting Top Intake/Exhaust



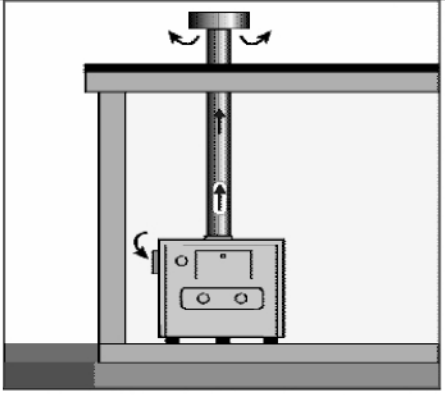
Horizontal Direct Venting With Vertical Combustion Air Intake Top Intake/Rear Exhaust



Vertical Direct Venting With Horizontal Combustion Air Intake Rear Intake/Top Exhaust



Horizontal Sidewall Venting Rear Exhaust



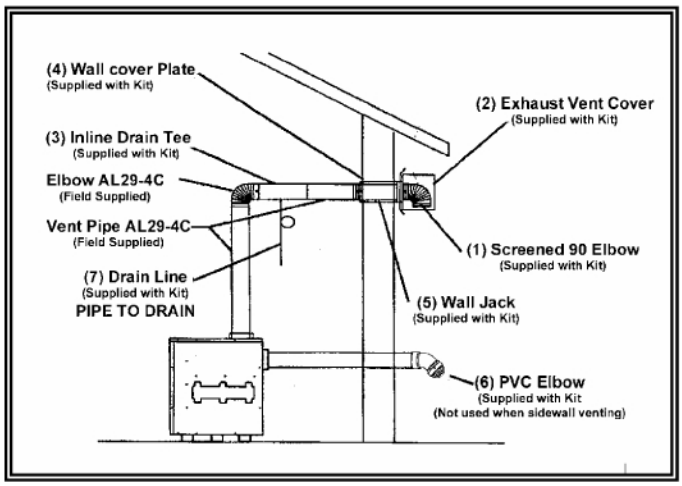
Conventional Vertical Venting Top Exhaust

Venting Options: The Genesis:

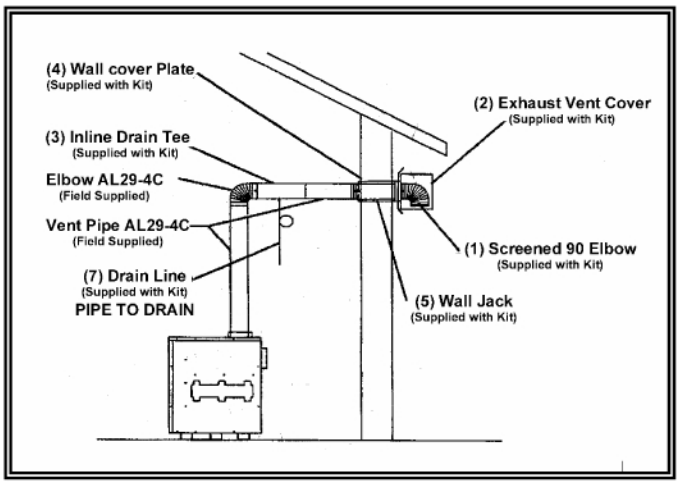
- may be vented from the top or rear of the unit. Vent material or equivalent length does not change
- may be vented vertically or horizontally
- may use room air or be direct vented.
- vertical vent, non-direct or direct is Category I.
- horizontal vent and horizontal direct vent are Category III. May NOT be common vented with other appliances.

Note: Horizontal vent and all horizontal direct vent installations require the use of AL29-4C vent material.

HORIZONTAL VENTING



Direct Vent



Sidewall Vent

VENTING INFORMATION TABLE

Model Heater	Vent size Inches	mm		Horizontal Room Air Intake + Single Exhaust Vent Pipe Max. Equivalent Feet	Horizontal or Vertical Direct Vent Maximum Equivalent Feet*
GW/B-200	4	101		110	60
GW/B-300	5	127		110	60
GW/B-400, 500	6	152		50	35
GW/B-650, 750	8	203		50	35

For vertical vent-non direct, follow the National Fuel Gas Code Sizing for Category I fan assisted. If more than 35 feet vertical height, installation of a barometric regulator is required.

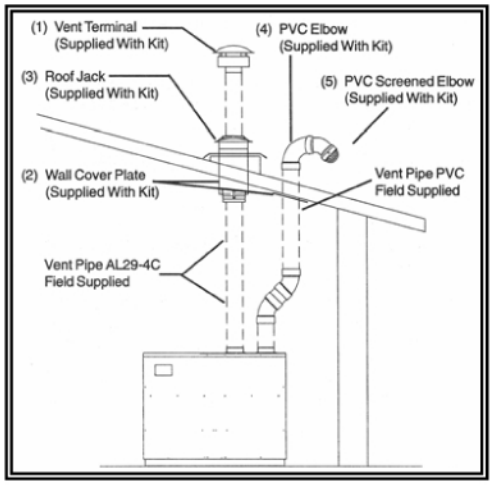
Kits contain AL-29-4C vent material.

A 90° elbow = 10 equivalent feet of pipe; a 45° elbow = 5 equivalent feet.

Note the requirement for AL 29 – 4C venting material when venting horizontally. If your local codes state that when venting vertically direct vent that the vent must be sealed, kits containing AL 29-4C materials must be used. Additional venting materials must also be AL 29-4C with these kits. If the sealed vent is not a code requirement, B venting materials may be used.

*Maximum equivalent feet exhaust and maximum equivalent feet air intake – each (example: 60' exhaust and 60' intake).

VENTING INFORMATION TABLE



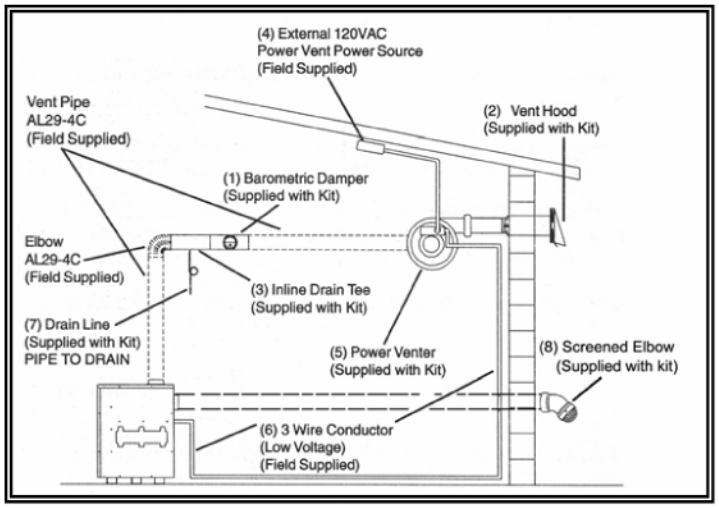
Vertical Direct Vent Terminal Kits (Vertical Air Intake)

Model Heater		Vent Size	Max. Equivalent Feet*
GW/GB 200		4"	60
GW/GB 300		5"	60
GW/GB 400, 500		6"	35
GW/GB 650, 750		8"	35

* Max equivalent feet of exhaust and maximum equivalent feet of air intake.

Vertical Direct Vent Kits (Horizontal Air Intake)			
Model		Vent Size	Max Equivalent Feet
GW/GB 200		4"	60
GW/GB 300		5"	60
GW/GB 400, 500		6"	35
GW/GB 650, 750		8"	35

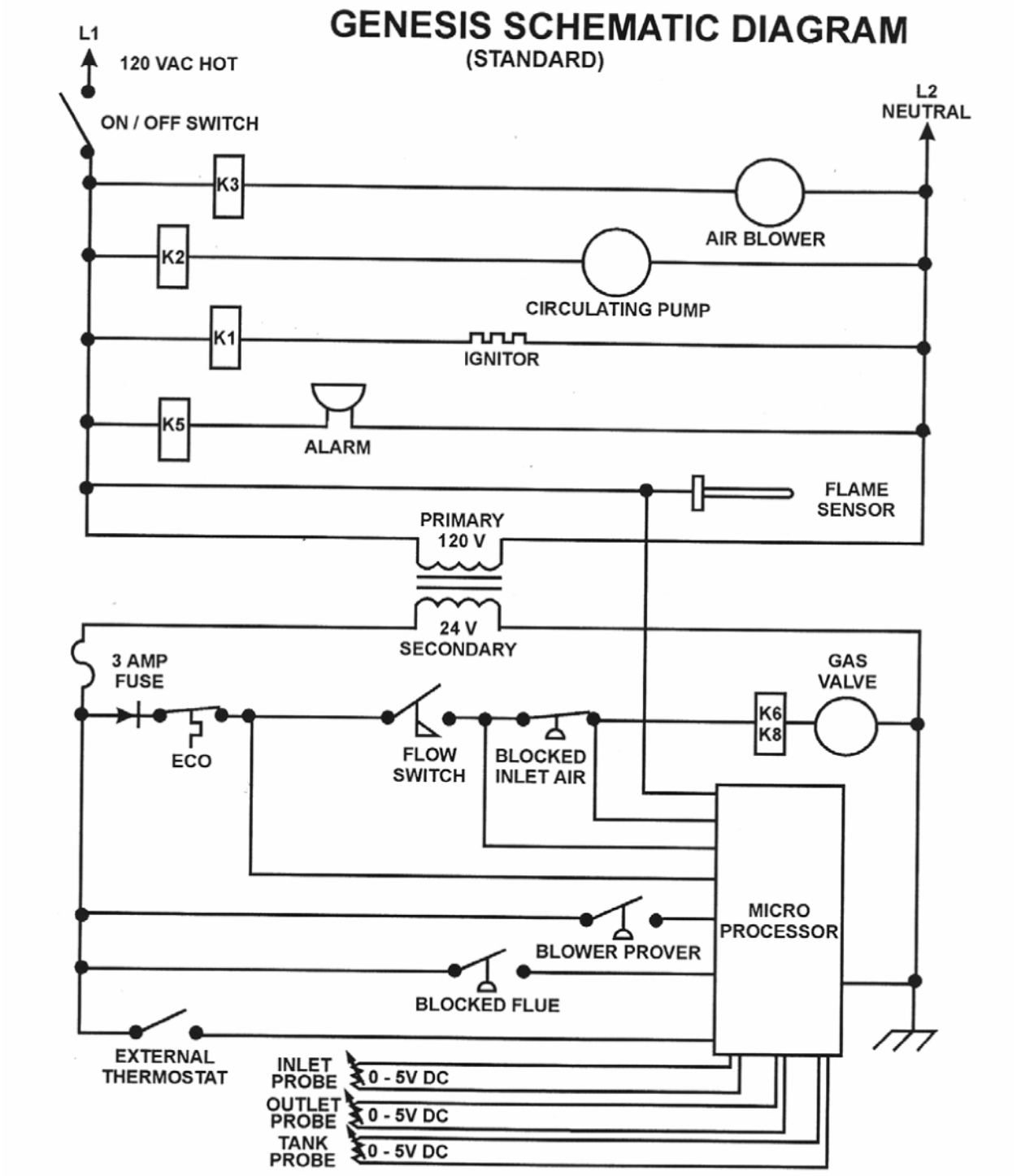
Horizontal Extended Direct and Sidewall Power Vent Kits



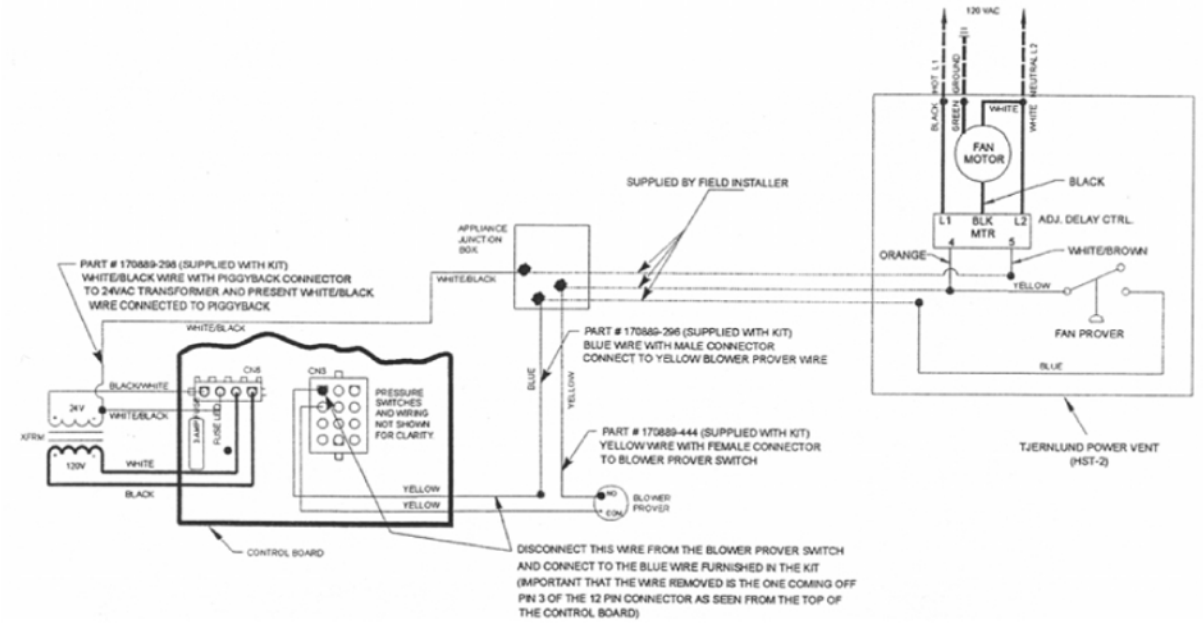
Model	Vent Size	Maximum Equivalent Feet of Piping	
		Sidewall Venting	Horizontal Direct/Sealed Venting Intake/Exhaust
GB, GW-200	4'	N/A	N/A
GB, GW-300	5'	N/A	N/A
GB, GW-400	6"	110'	60'/60'
GB, GW-500	6"	110'	60'/60'
GB, GW-650	8"	110'	60'/60'
GB, GW-750	8"	110'	60'/60'

90 Degree Ells = 10 Equivalent Feet of Pipe.
45 Degree Ells - 5 Equivalent Feet of Pipe.

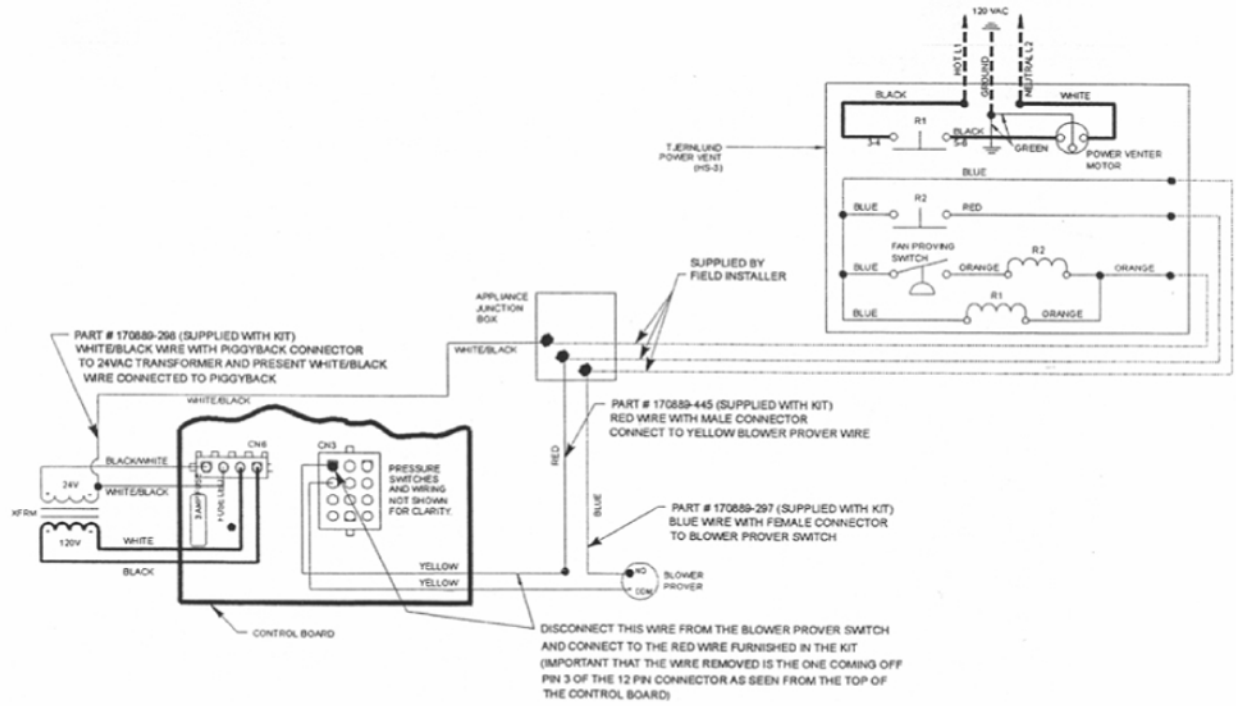
GENESIS SCHEMATIC DIAGRAM



GENESIS WIRING DIAGRAM
Power Vent Electrical Connection Diagram
(Genesis 400 & 500)



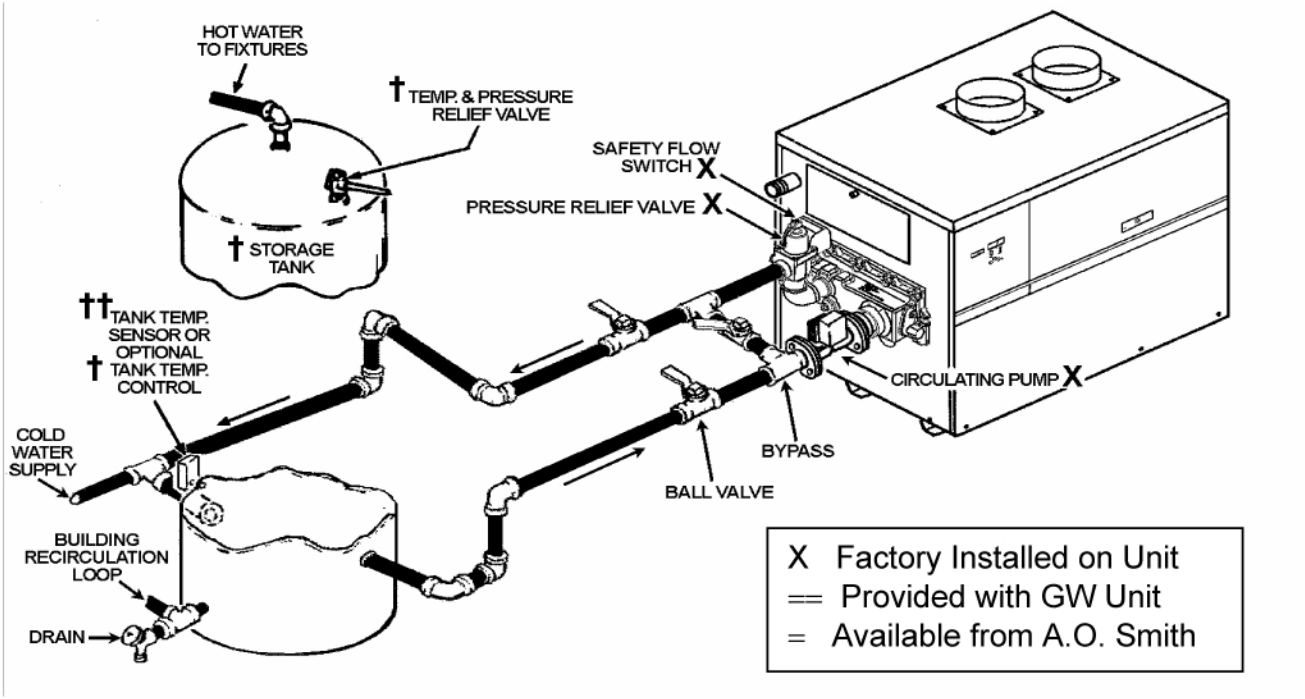
Power Vent Electrical Connection Diagram
(Genesis 650 & 750)



WATER PIPING

This manual will discuss using a Genesis GW (water heater) model installed for potable hot water. A separate manual will discuss installation of GB (Boiler) models for hydronic heating applications.

CER-TEMP 80® PIPING



Install Thermal Expansion Tank on Cold Water Supply Line, If Check Valve or Pressure Reducing Valve is Used in Supply

Proper flow rates through the Genesis will result in a 25-40° F temperature rise inlet to outlet.

- Available circulators base sizing on the use of 50 equivalent feet of piping between the storage tank and Genesis.
- Optional right end water connection is available from the factory.

Proper flow rates through the Genesis will result in a 25-40° F temperature rise inlet to outlet.

GENESIS PUMPS

STANDARD FLOW PUMPS

Genesis Water Heaters Model#	Cast Iron Bronze Fitted TACO# - H.P.	All Bronze Pumps TACO#	Electrical		
GW-200	007BF5-JW - 1/25 H.P	007BF-4	115	1Ø	.7 Amps
GW-300	007BF5-JW - 1/25 H.P.	007BF-4	115	1Ø	.7 Amps
GW-400	0012BF4-1J - 1/7 H.P.	0012BF-2	115	1Ø	1.33 Amps
GW-500	0012BF4-1J - 1/7 H.P.	0012BF-2	115	1Ø	1.33 Amps
GW-650	0012BF4-1J - 1/7 H.P.	0012BF-2	115	1Ø	1.33 Amps
GW-750	1911 - 1/4 H.P.	1911BZ 1/4 HP	115	1Ø	1.33 Amps

HARD WATER FLOW PUMPS

Genesis Water Heaters Model#	C.I. Bronze Fitted Pump TACO#	All Bronze Pumps TACO#
GW-200	0012BF2-1J	0012BF-2
GW-300	0012BF2-1J	0012BF-2
GW-400	0012BF2-1J	0012BF-2
GW-500	1911 1/4HP	1911B 1/4HP
GW-650	1911 1/3HP	1911B 1/3HP
GW-750	1935C 1/3HP	1935B 1/3HP

PRESSURE DROP INCLUDES THE LOSS THROUGH 50' (15.2M) OF PIPE AND NORMAL FITTINGS, WHEN INSTALLED WITH STORAGE TANK.

Model	Water Category	Flow Rate GPM	Flow Rate LPM	Head Loss Feet	Head Loss Meter	Rise Temp. F	Rise Temp. C	Pipe Size
GW 200	Normal	17	64	4.4	1.3	20	2.4	1 1/2"
	Hard	23	87	7.7	2.3	15	4.3	1 1/2
GW 300	Normal	17	64	4.4	1.3	30	5.3	1 1/2
	Hard	25	95	9.5	2.9	20	5.3	1 1/2"
GW 400	Normal	23	87	8	2.4	30	4.4	1 1/2"
	Hard	34	129	6	1.8	20	3.3	2"
GW 500	Normal	28	106	4.6	1.4	30	2.6	2"
	Hard	42	159	9.1	2.8	20	5.1	2"
GW 650	Normal	37	140	6.2	1.9	30	3.4	2"
	Hard	55	208	12.2	3.7	20	6.8	2"
GW 750	Normal	42	159	9.7	3.0	30	5.4	2"
	Hard	63	238	18.8	5.7	20	10.4	2"

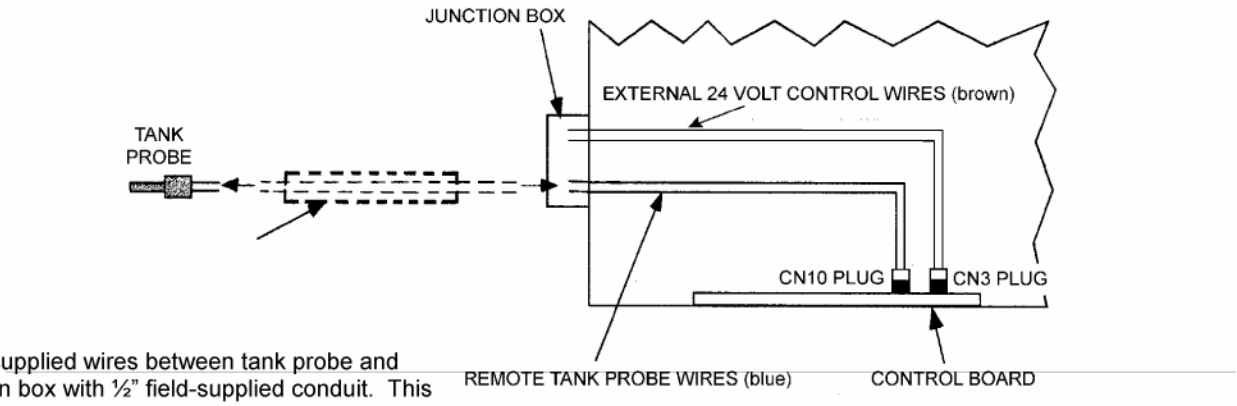
WATER CATEGORY	GRAIN HARDNESS PER GAL.
NORMAL	1 THROUGH 15
HARD	OVER 15

CONTROLS

CONTROL SETTINGS

Control	Settings	Comments
Tank Temperature Sensor (thermistor)	Adjustable range 110-190 degrees. Fixed 5° differential	Set to desired storage tank temperature. A recommended safe setting is 120-125 degrees to minimize the risk of scalding. Be certain jumper is installed on J33 terminal
Boiler Outlet Temperature Device	Adjustable setting 110-240 degrees F. Adjustable differential (switching differential) of 5-50° F.	Senses boiler outlet water temperature. Set to desired tank temp. + 40°.
High Temperature Limit Control.	Fixed at 250° F.	Press "Select" to reset.
Alternate 24V Tank Thermostat Control	Adjustable 100-180° F 5° differential	J33 would not be installed

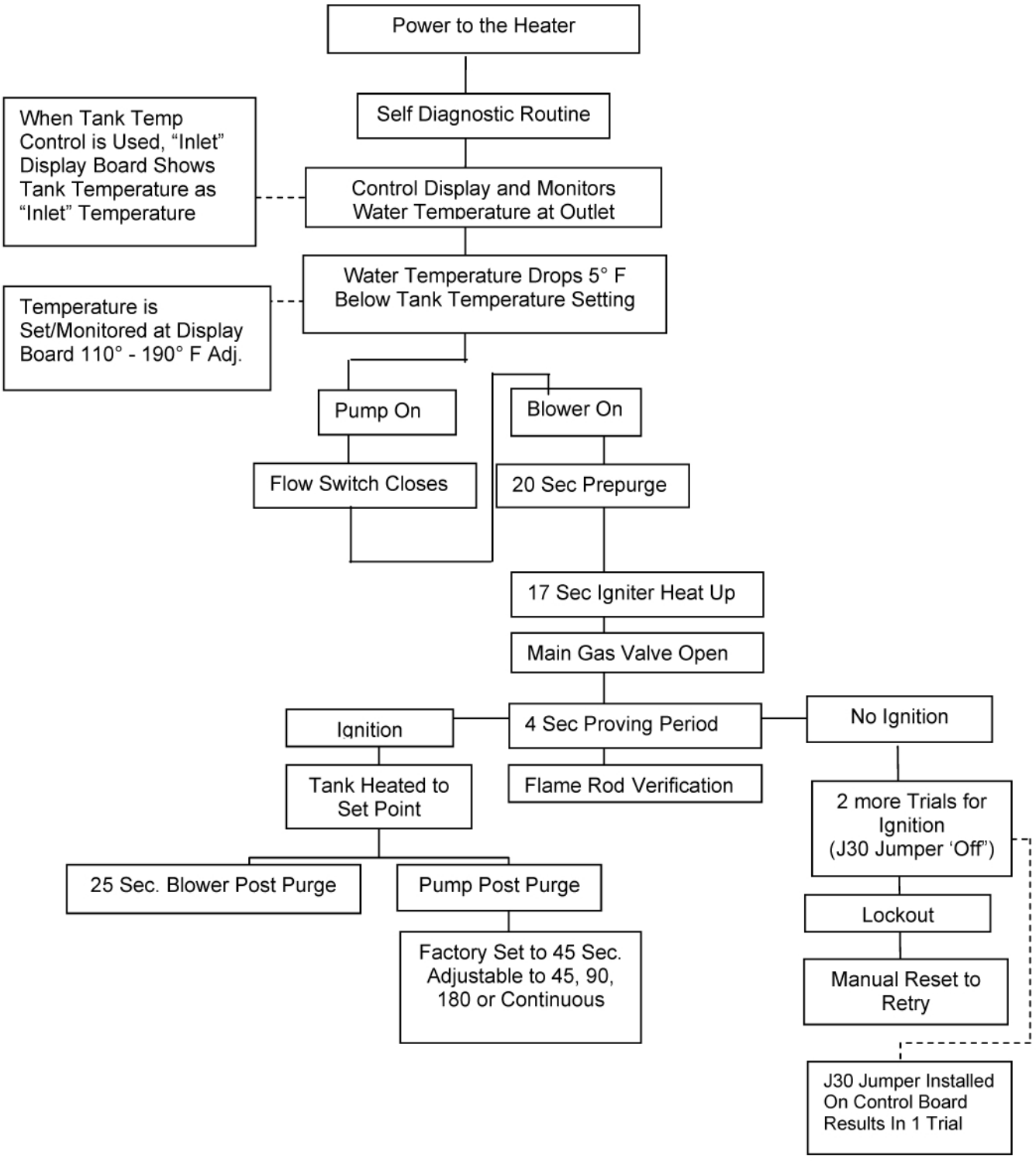
Genesis Junction Box



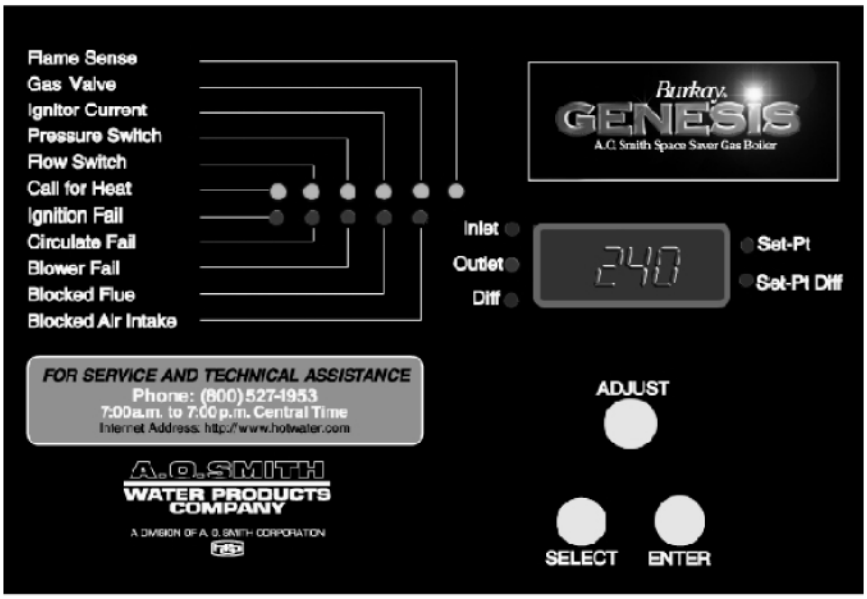
Field-supplied wires between tank probe and junction box with ½" field-supplied conduit. This conduit and wiring should be separate from any other conduit/wiring to guard against EMI (electromagnetic interference).

Connect 24V thermostat (if thermistor is not used) to Junction Box brown wires.

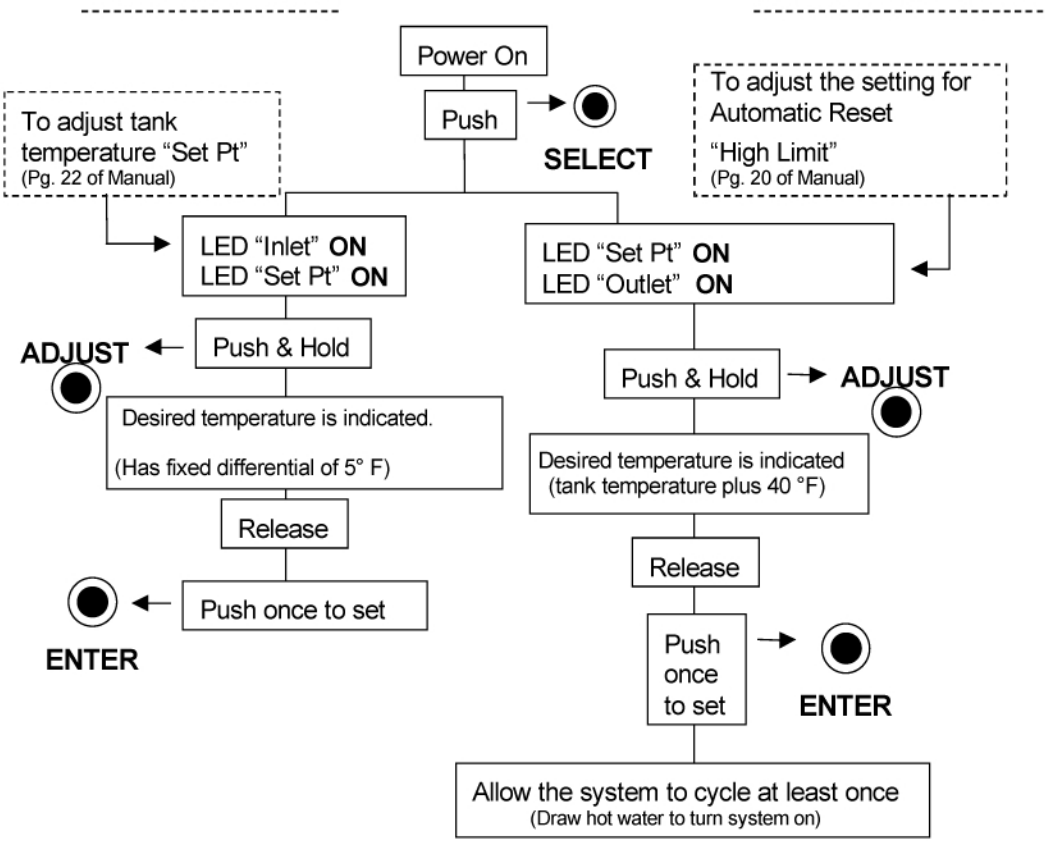
GENESIS SEQUENCE OF OPERATION


Power to the Heater
Self Diagnostic Routine
When Tank Temp Control is Used, "Inlet" Display Board Shows Tank Temperature as "Inlet" Temperature
Control Display and Monitors Water Temperature at Outlet
Water Temperature Drops 5° F Below Tank Temperature Setting
Temperature is Set/Monitored at Display Board 110° - 190° F Adj.
Pump On
Blower On
Flow Switch Closes
20 Sec Prepurge
17 Sec Igniter Heat Up
Main Gas Valve Open
Ignition
4 Sec Proving Period
No Ignition
Tank Heated to Set Point
Flame Rod Verification
2 more Trials for Ignition (J30 Jumper 'Off")
25 Sec. Blower Post Purge
Pump Post Purge
Lockout
Factory Set to 45 Sec. Adjustable to 45, 90, 180 or Continuous
Manual Reset to Retry
J30 Jumper Installed On Control Board Results In 1 Trial

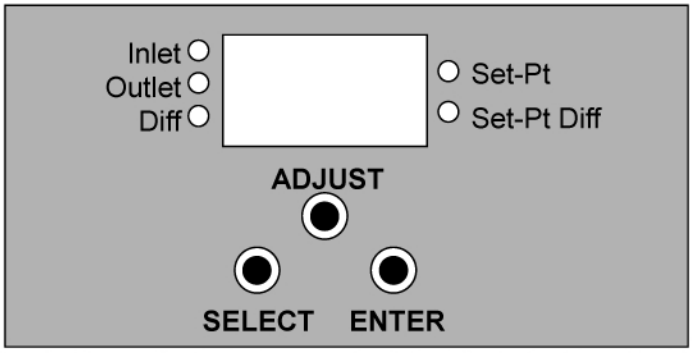
TO ADJUST TANK TEMPERATURE AND/OR AUTOMATIC RESET HIGH LIMIT (BOILER OUTLET) WATER TEMPERATURE



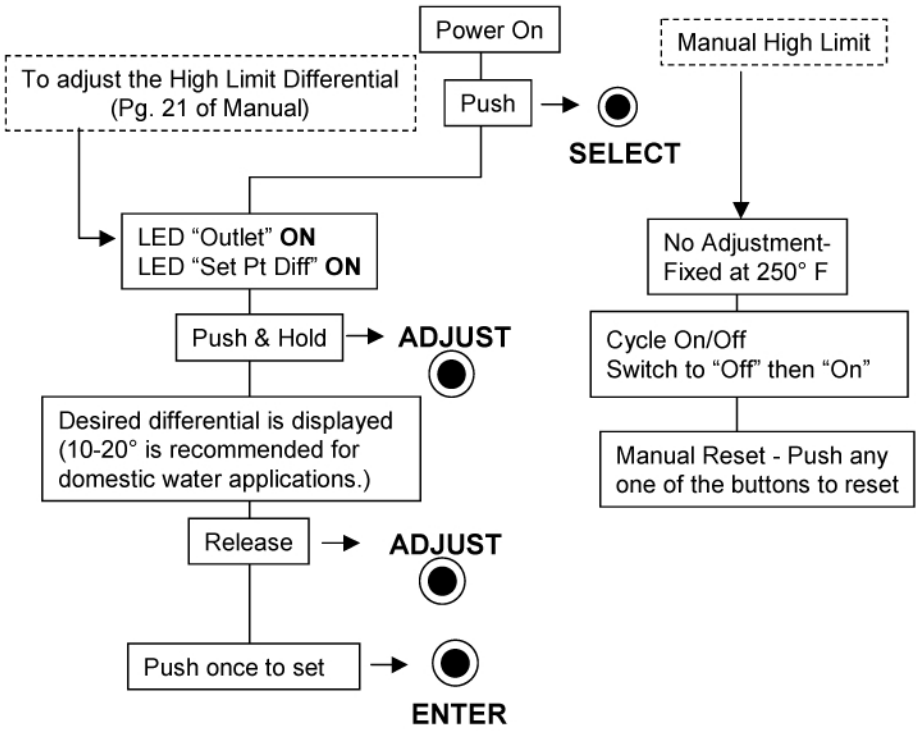
Note: Releasing then pushing "Adjust" reverses the indicator's direction (up or down)



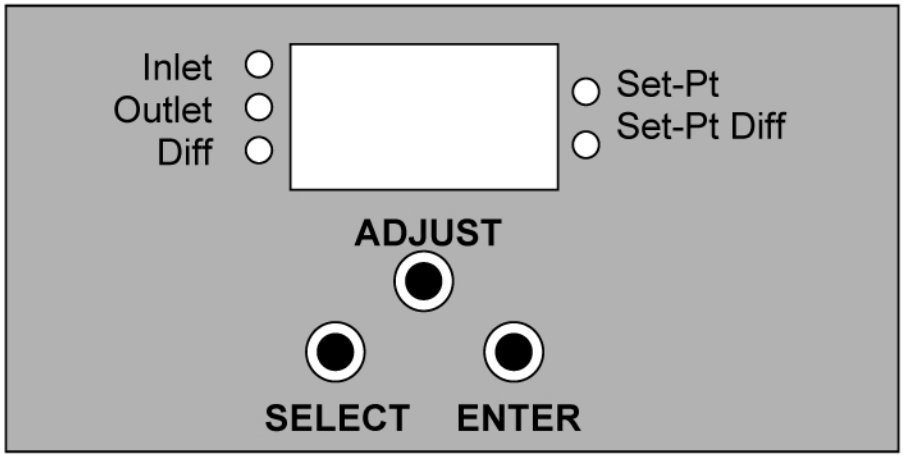
TO ADJUST AUTOMATIC RESET HIGH LIMIT (BOILER OUTLET) WATER SETTING DIFFERENTIAL



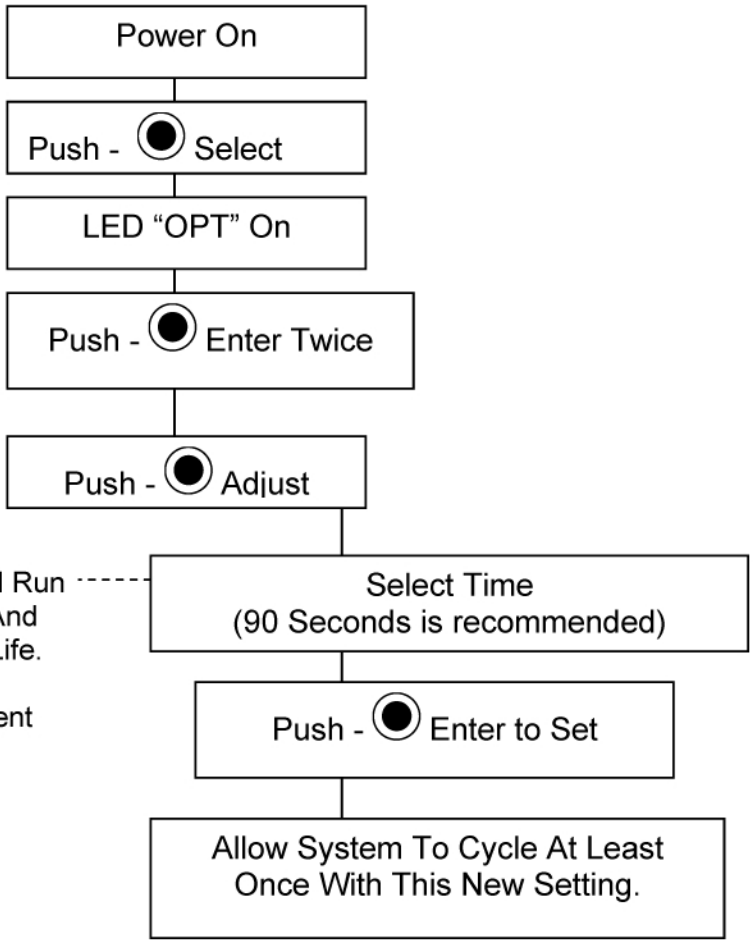
Note: Releasing then pushing "Adjust" reverses the indicator's direction (up or down) ▲▼


Power On
To adjust the High Limit Differential (Pg. 21 of Manual)
Push
SELECT
Manual High Limit
LED "Outlet" ON
LED "Set Pt Diff" ON
No Adjustment- Fixed at 250° F
Push & Hold
ADJUST
Cycle On/Off Switch to "Off" then "On"
Desired differential is displayed (10-20° is recommended for domestic water applications.)
Manual Reset - Push any one of the buttons to reset
Release
ADJUST
Push once to set
ENTER

CIRCULATING PUMP ADJUSTMENT PROCEDURE

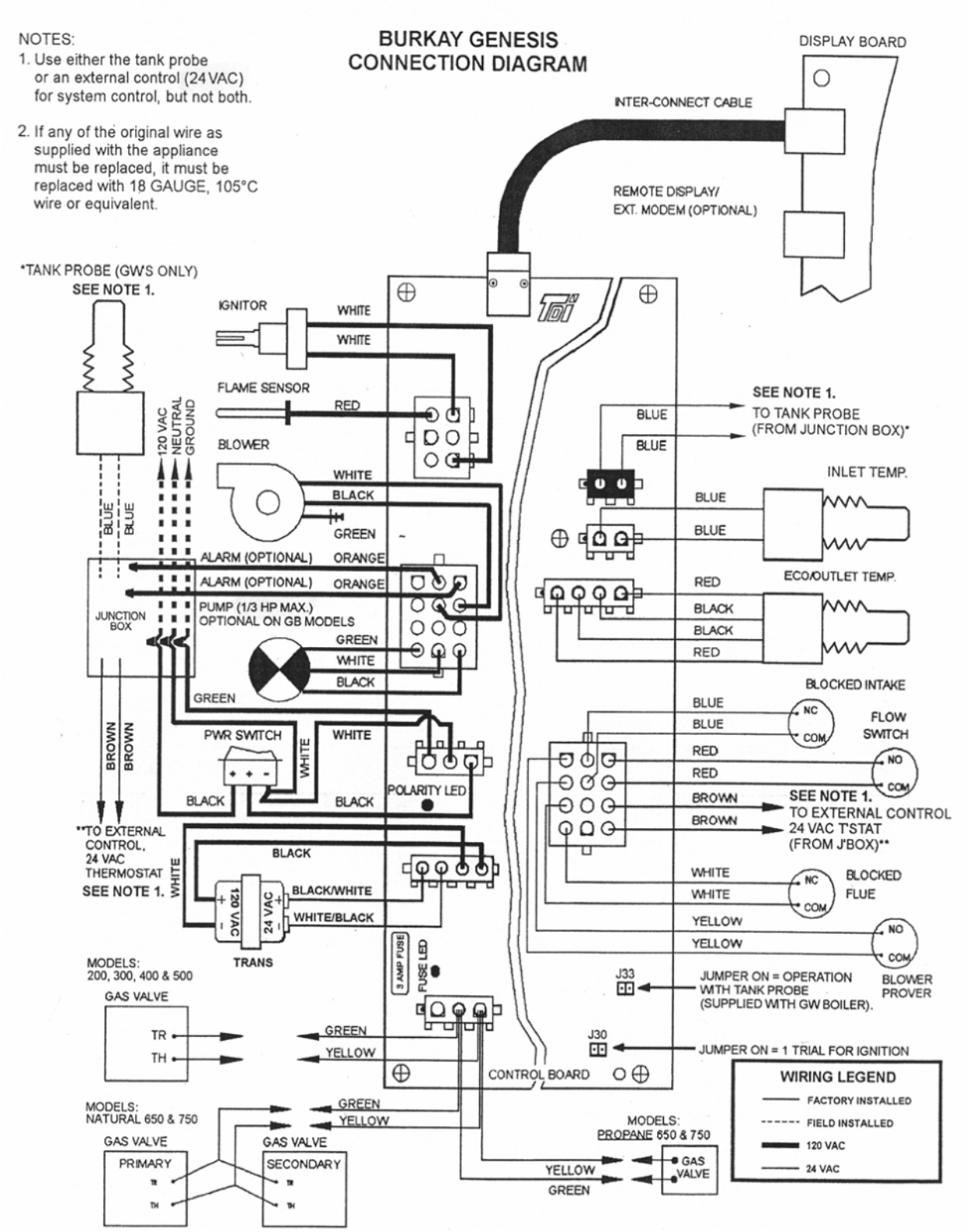


Note: Releasing then pushing "Adjust" reverses the indicator's direction (up or down) ↑ ↓



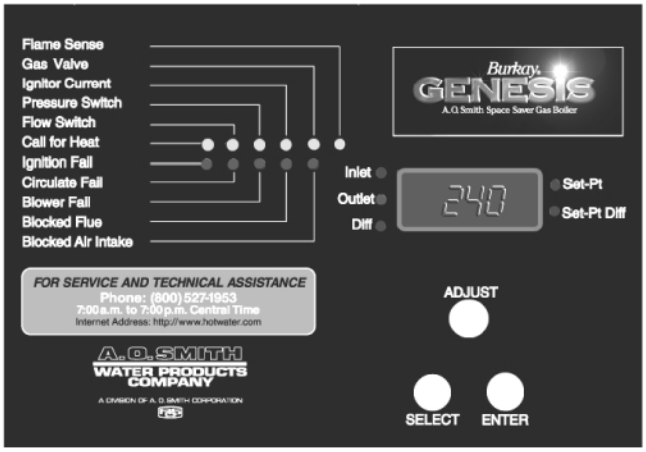
Do Not Select "ON". Pump Will Run Constantly. This Is Inefficient And May Shorten Heat Exchanger Life. An Exception Might Be To Temporarily Use "ON" To Prevent Freezing In The Exchanger.

GENESIS CONNECTION DIAGRAM

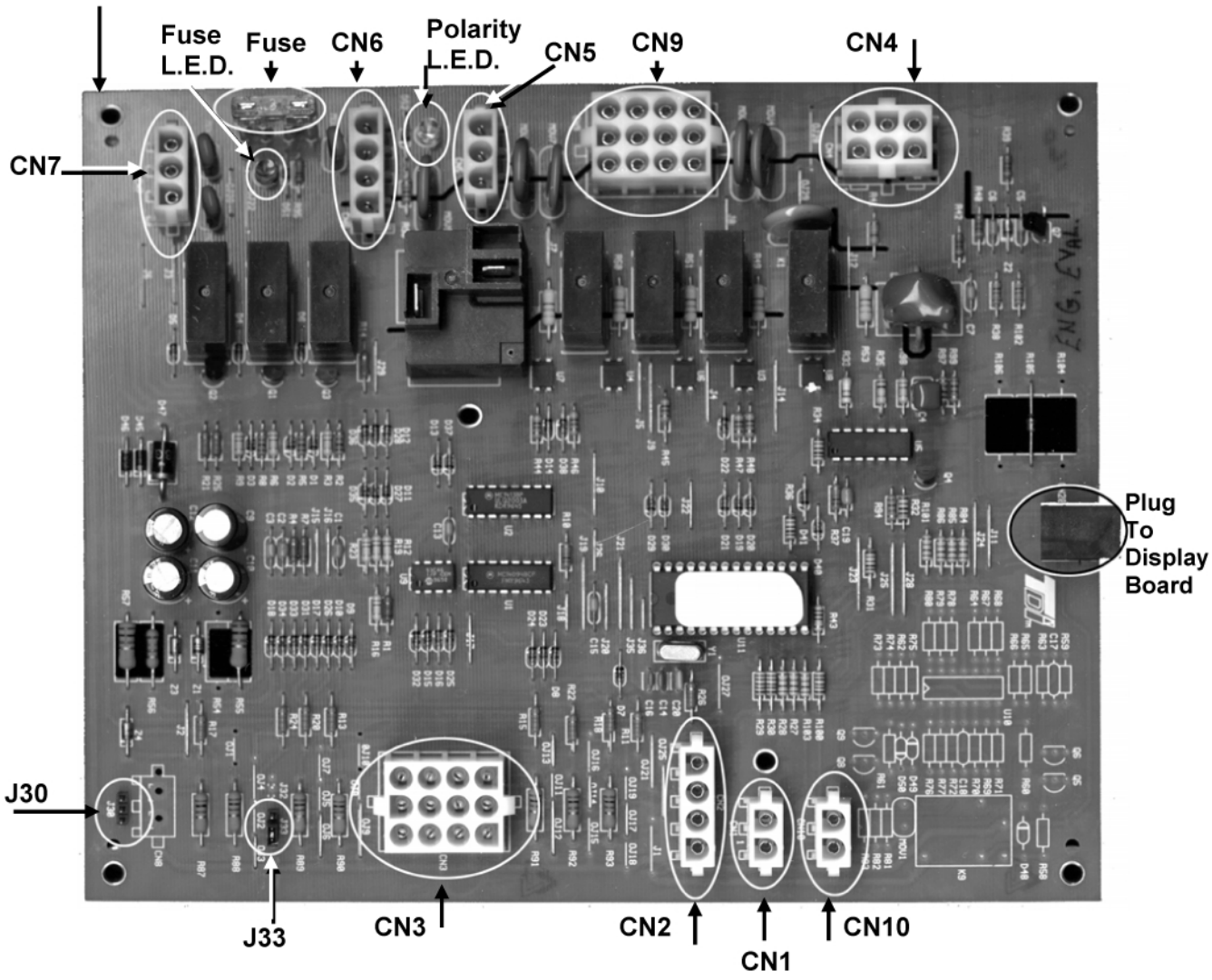


GENESIS CONTROLS

Display Board



The Control Circuit Board



PRE-STARTUP SERVICE CHECKS

Before troubleshooting the Genesis heater, verify:

- Proper gas type, pressure and pipe size is supplied to the heater
- The storage tank and piping are full of water – air purged
- Automatic reset high limit on the heater is set at least 40°F above tank control setting
- 120 VAC is supplied to the heater
- Venting is according to boiler instruction manual
- All plugs on the control board are firmly in place
- Proper pressure relief valve, pump (GW models) and flow switch were factory installed
- (GW Models) The supplied tank temperature sensor (thermistor) or optional 24 VAC tank thermostat is installed and wired to the heater
- Control board has J33 installed if supplied tank sensor (thermistor) is used – not installed if 24 VAC tank thermostat is used
- Air intake and exhaust are free of blockage such as
    - dirt
    - snow
    - leaves
    - etc.
- Genesis is properly grounded.

Start-Up Air Adjustment

The boiler is tested at the factory and should start properly if installed in accordance with the boiler instruction manual. The boiler may have a slight rumble on a cold start. This is normal and will not harm the unit nor is it a safety issue. The rumble is caused by cold water in the heat exchanger creating a cold combustion chamber, thus the rumble occurs. Once the boiler has been started from a cold start the rumble will disappear on subsequent starts.

Should the boiler not start, a minor air shutter adjustment may be required by the installer, as atmospheric conditions may change the amount of air supplied to the unit at the given installation site.

The easiest way to do this is to, turn off the gas to the unit, pull the tube off the blower prover switch (far right) and hook it to a U-Tube Manometer. Turn the unit on,

> **GB & GW-200 thru 750 Models: adjust the air shutter until you get 0.5" W.C. of pressure at the Blower Prover Switch. After start up, a draft reading of -.02 to -.04" W.C. is acceptable. Higher than -.04 indicates that a draft regulator should be added to lessen the "pull" through the boiler.**

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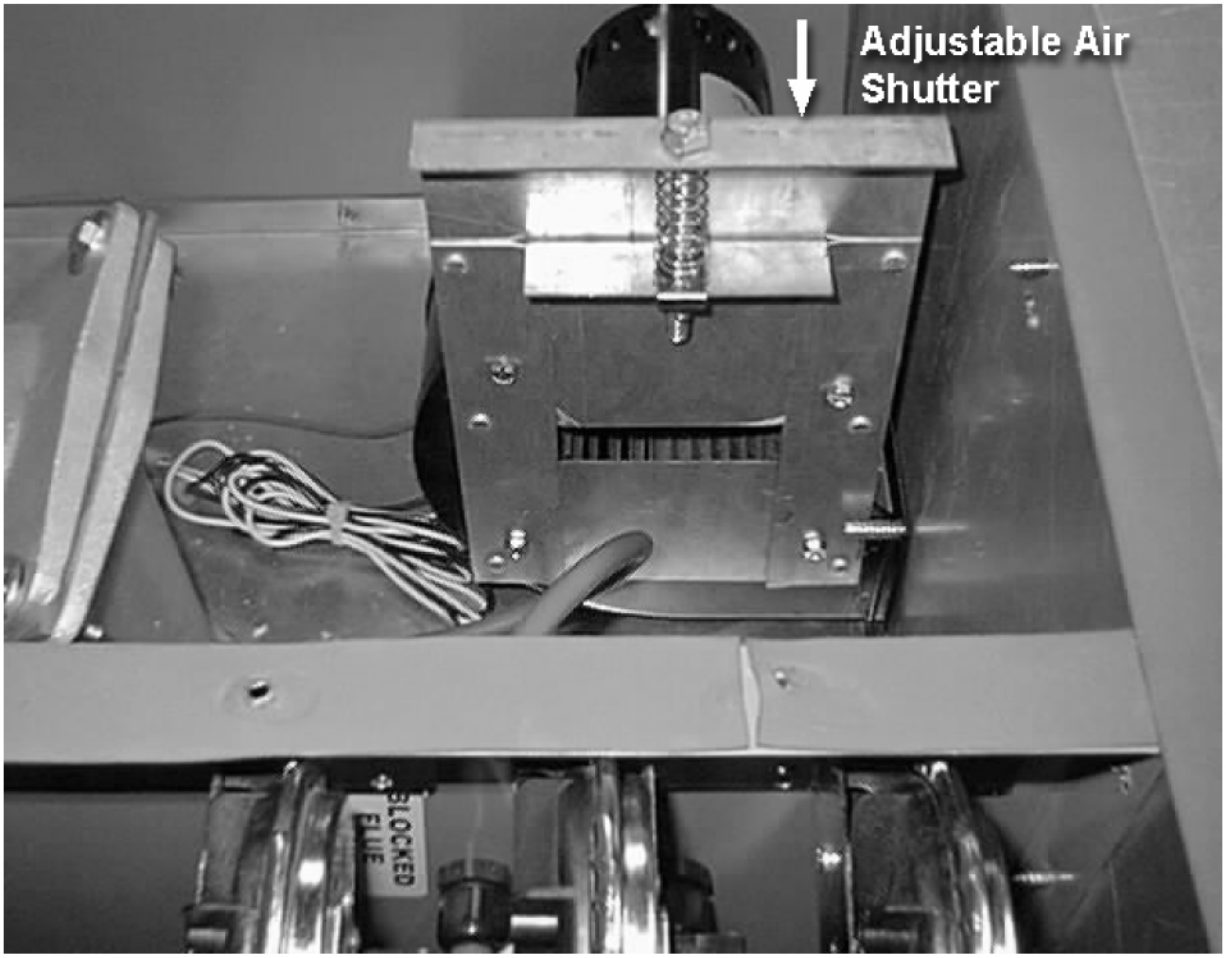
Start-Up Air Adjustment (continued)
Reconnect the tube to the blower prover switch and restart the boiler. This is an approximate set point for getting the boiler started. If the boiler continues to start or run rough after the initial cold start, adjust the air shutter until the boiler starts smoothly.

DO NOT try to adjust the boiler gas/air mixture to make the flame sit on the burner.
This is a powered burner and the flame is not supposed to be on the burner. The flame should be just above the burner deck approximately 1/8" to ¼" and constant blue in color.

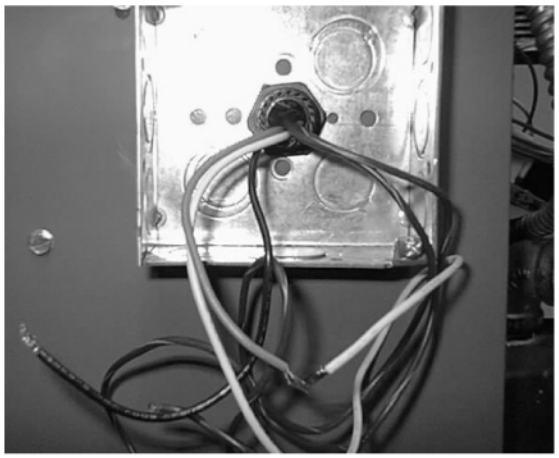
See also: Label instructions on the Genesis – located below the view port.

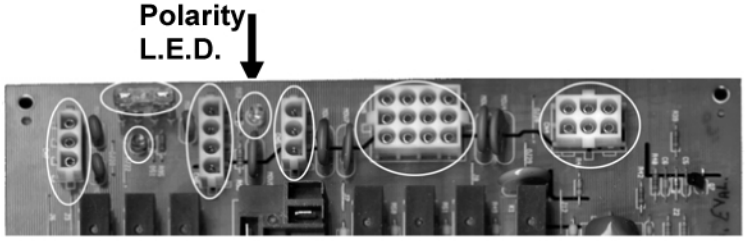


LINE POLARITY INDICATOR

Supply power polarity is important to the heater. Before connecting 120VAC to the heater junction box, be certain that a white (neutral) wire to ground check results in a "0" voltage reading. Incorrect wiring may cause failure to prove flame signals, unexplained error codes or eventual board failure. The green LED should also confirm that supply wiring is correct by being "on" when the on/off toggle is turned on.

Polarity Check Within Junction Box





Genesis Control Board

Check voltage from supply voltage white wire to ground.

If the meter …	**then …**
does not read ϕ VAC	correct wiring.
reads ϕ VAC	go to Step 1.

Fuse Protection

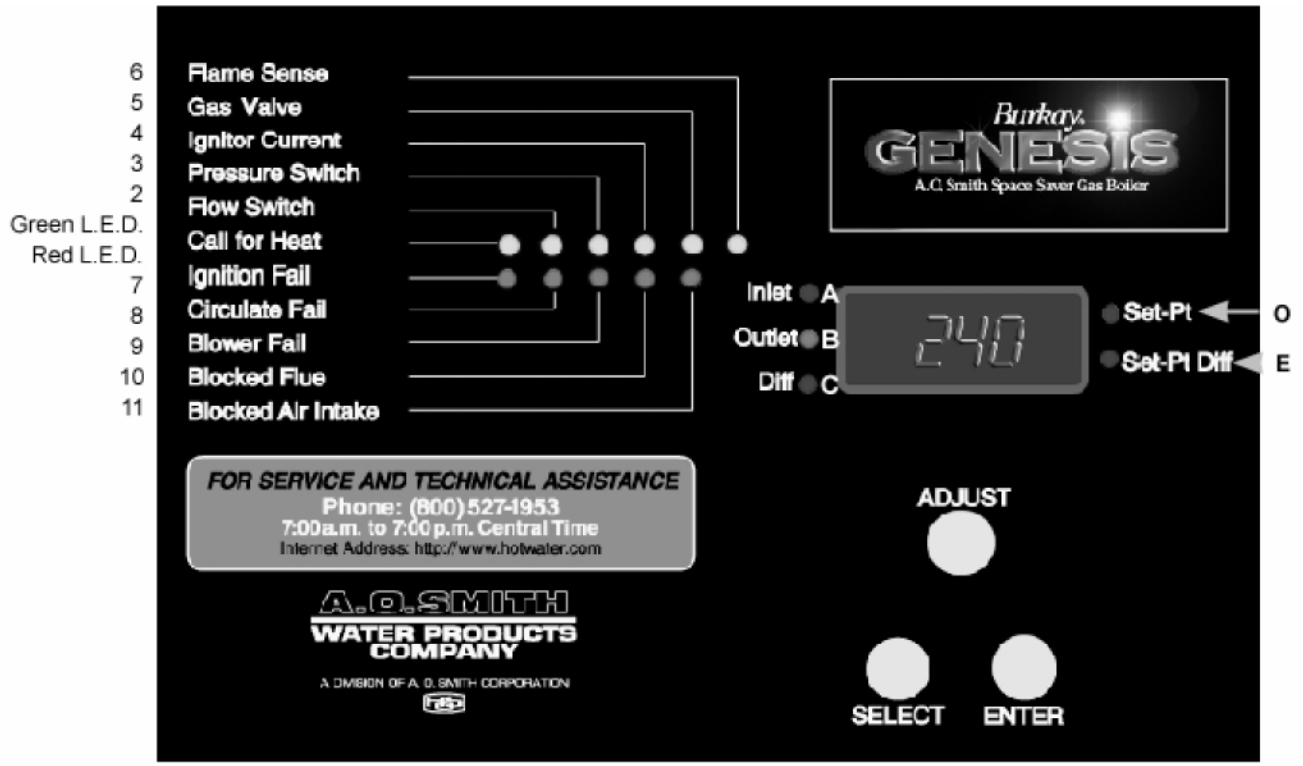
The 24VAC circuitry is protected with a 3 AMP fuse. Repeated failure of the fuse is an indication of possible damage to the ignition control.

Adjustable Settings On The Genesis Display Board

1. Storage water temperature
2. Post-circulate time
3. Boiler outlet water temperature
4. Boiler outlet water temperature differential

TROUBLESHOOTING STEPS

After verifying the information on the previous pages note the indicating L.E.D. lights on the display board as well as the scrolling text. The control does a system self-diagnosis on each call for heat.



L.E.D. lights come on left to right
The boiler's instruction manual refers to the green L.E.D.s by number (1-6, left to right) and red L.E.D.s (7-11 left to right).
The "Inlet " L.E.D. is "A": "Outlet" ="B": Diff" ="C": "Set Pt" = "0" and "Set Pt. Diff." as "E".

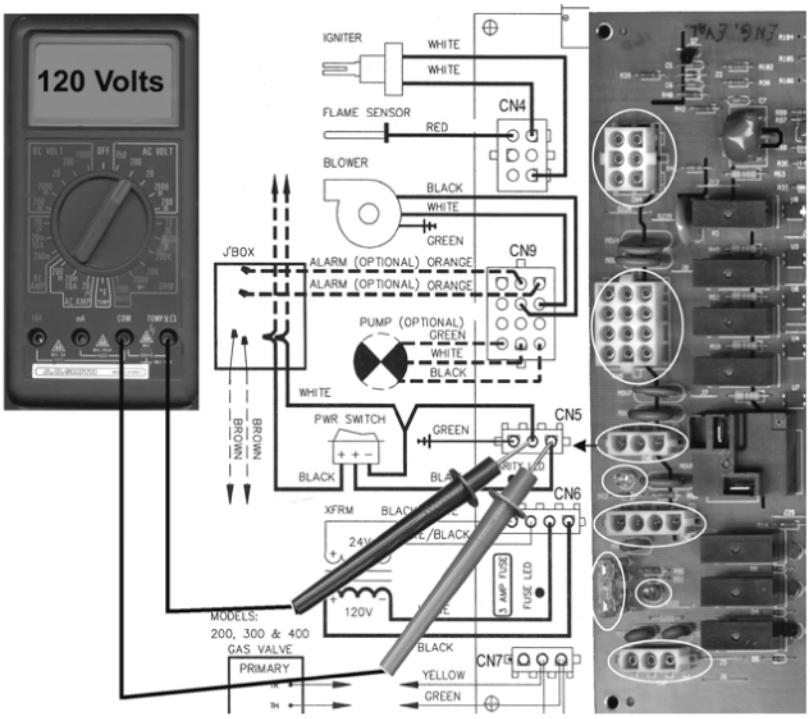
Each of the following steps assumes that previous steps are working properly

In troubleshooting the appliance, be aware that **diagnostic readings** on the display board **may vary** depending on **when** the failure actually occurred during the cycle of operation. For the following troubleshooting steps, the diagnostic readings on the display board are based on the failure taking place during burner operation **after flame verification** has been established.

STEP 1 – 120 VAC TO CN 5 POWER SUPPLY TERMINAL

Conditions:

- "Call for Heat" LED "Off"
- Stored water is colder than tank temperature control setting (minus differential)
- On/Off switch "On"
- Power "On"



- Plug is in CN5 receptacle

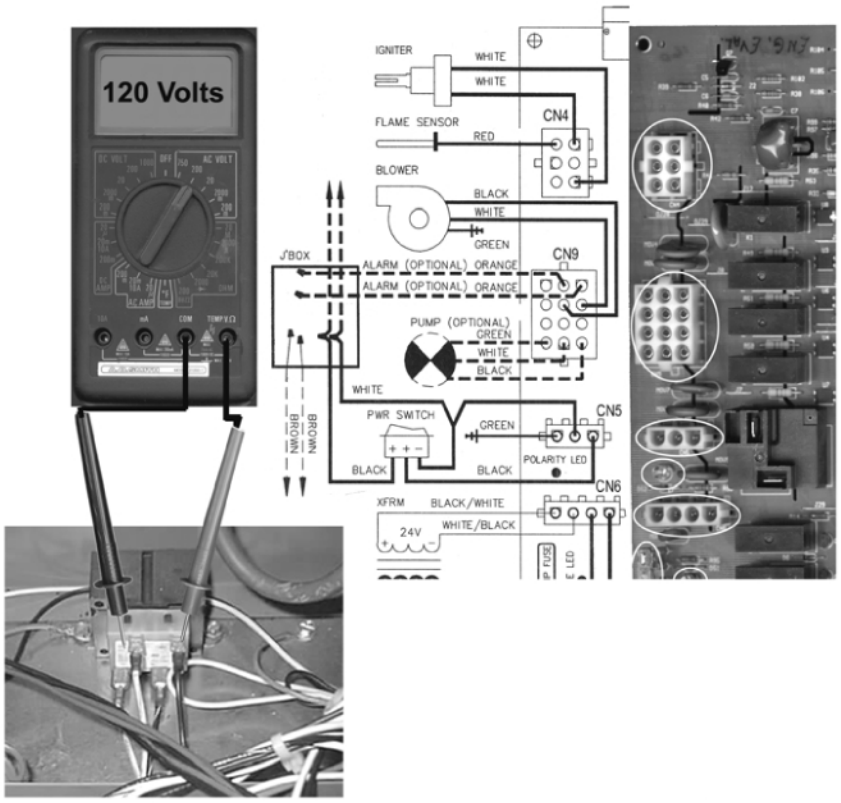
STEP 1	**120VAC TO CN-5 SUPPLY POWER TERMINAL**
	Test between the black and white wire pins on back of plug.

If …	and …	then …
120VAC **is not present**	on/off switch is on	• check wires and their connections to plug CN5 and on/off switch. • ensure that plug is inserted completely into receptacle CN5. • check other wire connection to CN5 plug and junction box. • replace switch.
120VAC **is present**		go to Step 2.

STEP 2 – 120 VAC TO TRANSFORMER

Conditions:

- "Call for Heat" "Off"
- Stored water is colder than tank temperature control setting (minus differential)
- Tank temperature should be activating call for heat.



- Plug is in CN6 receptacle
- Black and white wires are connected to upper (120 VAC) transformer terminals.

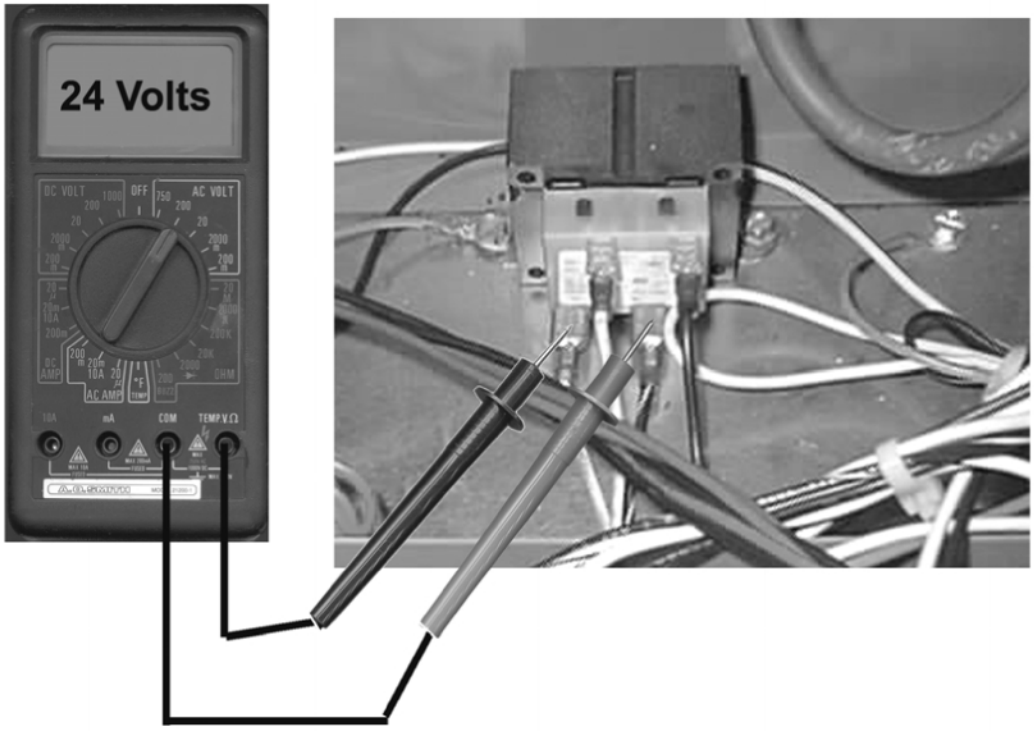
STEP 2	**120VAC TO TRANSFORMER**
	Test between the black and white wires (120VAC) terminals at the transformer.

If …	then …
120VAC **is not** present	• check wire connections to transformer and CN6 plug. • Check that plug is completely inserted into CN6. • replace control board.
120VAC **is present**	continue to Step 3.

STEP 3 – 24 VAC to CN6 CHECK

Conditions:

- "L.E.D. call for heat "Off"
- Stored water temperature should be activating a call for heat.



- Plug is in CN6 receptacle
- 24VAC wires attached to lower terminals of the transformer

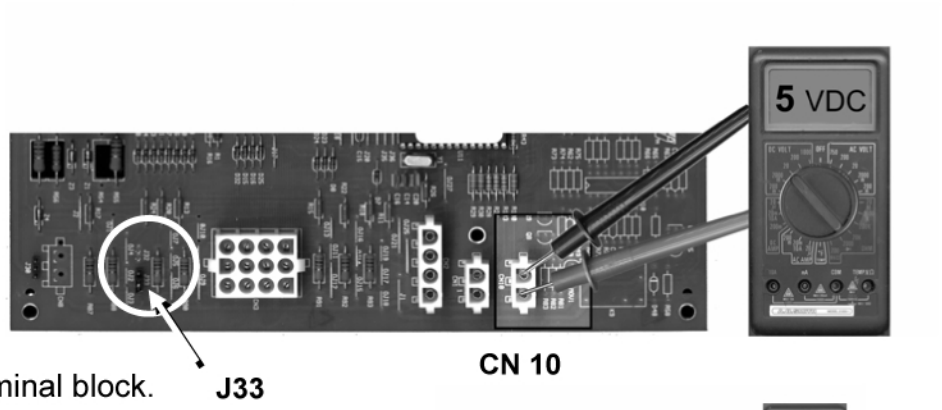
STEP 3	**24VAC CHECK TO CN6**
	Test between the black/white and white/black (24VAC) wire connections on plug CN6.

If …	**then …**
24VAC **is not** present	• check that 3 Amp fuse is not open. • check connections to 24 VAC terminals of transformer and CN6 plug • check that plug is completely inserted into CN6. • replace transformer.
24VAC **is** present	continue to Step 4.

STEP 4 – TANK SENSOR PROBE-RESISTANCE CHECK/5V DC MINIMUM TANK SENSOR CHECK

Conditions:

- Tank water temperature should be activating a call for heat
- Call for Heat L.E.D. is "Off" or, boiler not shutting off at tank sensor probe temperature setting and/or boiler shutting off at outlet probe temperature setting.
- Disconnect plug from CN 10 (Red) terminal block.



Temperature versus Resistance Curve for Tank Probe	
Tank Water Temperature °F	Resistance (Ohms) ± 3%
50	19,903
80	9,300
120	3,759
140	2,488
160	1,687
180	1,169

To Tank Sensor/Thermistor

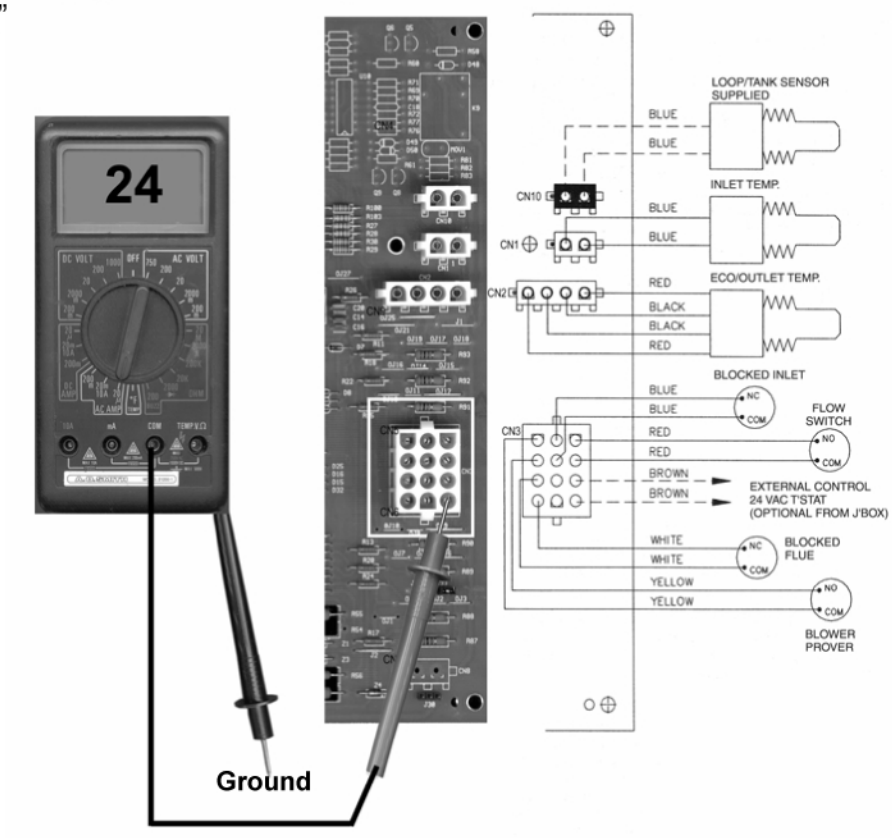
STEP 4	TANK SENSOR PROBE – RESISTANCE CHECK/5VDC MINIMUM TO TANK SENSOR PROBE CHECK
	Test from pin to pin terminals on the tank sensor probe plug. Test for 5V DC between the two middle terminals on CN10 receptacle.

If …	then …
resistance **is not correct** (see table for approximate Ohms resistance)	• check all wires and their connections (associated with this sensor probe). • replace tank sensor probe.
resistance and voltage **are correct**	• verify that jumper is installed at location J33 of control board. • "Call for Heat" LED should be green. If not – check/replace interconnect cable and/or display board. • if still not okay, replace control board. • go to Step 5.

STEP 5 – ALTERNATE 24V TANK THERMOSTAT CHECK

Conditions:

- Tank below thermostat setting (minus differential)
- Call for Heat L.E.D. "Off"
- Power "On"
-



- Plug installed in CN3 receptacle

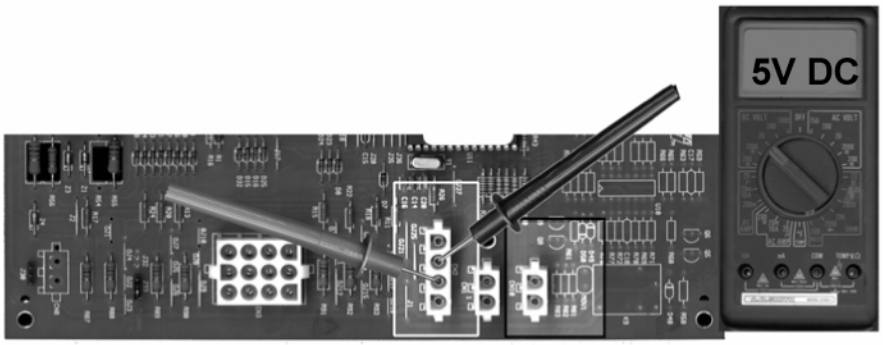
STEP 5	ALTERNATE 24VAC TANK THERMOSTAT CHECK
	Test between each brown wire connect on CN3 and ground.

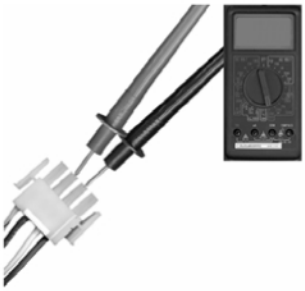
If …	then …
24 VAC **is not present** to either wire and ground	• replace control board
24 VAC **is present** to only one wire and ground	• verify that tank thermostat is "closed". • check brown wire connects to and from tank control (including junction box connections).
24 VAC power **is present** at each brown wire connect and ground	• verify that J33 terminal does not have a jumper installed • continue to Step 6.

STEP 6 – OUTLET SENSOR PROBE RESISTANCE CHECK/5V DC TO OUTLET

Conditions:

- "Call for Heat" – LED "On"
- 20 Loc Out open outlet probe





Temperature versus Resistance Curve for Tank Probe	
Tank Water Temperature °F	Resistance (Ohms) ± 3%
50	19,903
80	9,300
120	3,759
140	2,488
160	1,687
180	1,169

- Plug is removed from CN2 receptacle for 5V DC minimum check
- Plug is removed from CN2 receptacle for resistance check

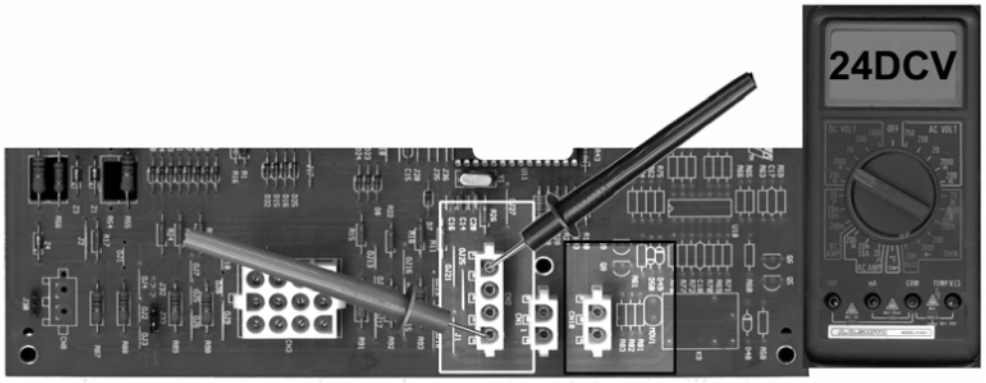
STEP 6	OUTLET SENSOR PROBE RESISTANCE CHECK/5VDC MINIMUM TO OUTLET SENSOR PROBE CHECK	
	Resistance test between the two (middle, black wire) pin terminals on the outlet/ECO sensor probe plug.	**Test for 5V DC between the two middle wire terminals on CN2 receptacle.**

If …	then …
resistance **is not** correct (see table for approximate Ohms resistance)	• check all wires and their connections (associated with this sensor probe). • replace outlet sensor/ECO probe.
5VDC **is not present**	• replace control board.
resistance and voltage **are correct**	• green "Call for Heat" LED should be "ON". • check/replace interconnect cable before replacing display board • if still not okay, replace control board. • go to Step 7.

STEP 7 – ECO SENSOR PROBE CHECK/24VDC TO ECO SENSOR PROBE CHECK

Conditions:

- "Call for Heat" – LED "ON"
- 12 Loc Out ECO fail



- Plug is removed from CN2 receptacle for continuity check
- Power "Off" for Ohms resistance check
- Plug is removed in receptacle for 24V DC check
- Power "ON" for 24V DC check

STEP 7	**ECO SENSOR PROBE CHECK/24V DC TO ECO SENSOR PROBE CHECK**	
	Check for continuity between the two (outside, red wire) pin terminals on the outlet/ECO sensor probe plug	**Test for 24V DC between the two (that correspond to two red wires on plug) terminals on CN2 receptacle.**

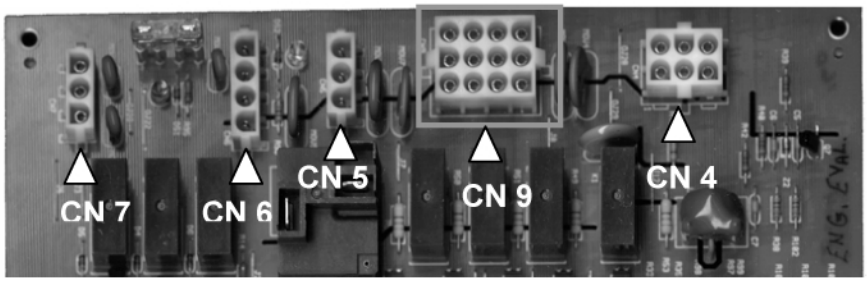
If …	**then …**
there **is no continuity**	• check all wires and their connections (associated with ECO sensor probe). • replace outlet sensor/ECO probe.
24V DC **is not present**	• replace control board.
there **is continuity** and voltage is correct	• green "Call for Heat" LED should be "ON". • check/replace interconnect cable before replacing display board. • if still not okay, replace control board. • go to Step 8A.

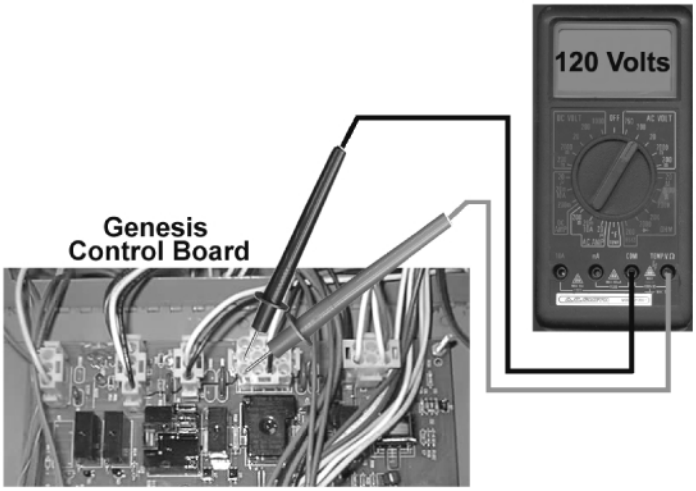
If Boiler is set for 3 trials for ignition (Jumper J 30 Not installed) Skip Steps 8-13 and begin with Step 8A on Page 42.

STEP 8 – 120 VAC POWER TO PUMP CHECK

Conditions:

- "Call for Heat" - LED "On"
- 6 Loc Out Circulation Fail
- Jumper J30 – Installed
- Plug connected to CN9 receptacle
- Power On





STEP 8	120VAC POWER TO PUMP CHECK
	Test between black and white terminals on plug CN9.

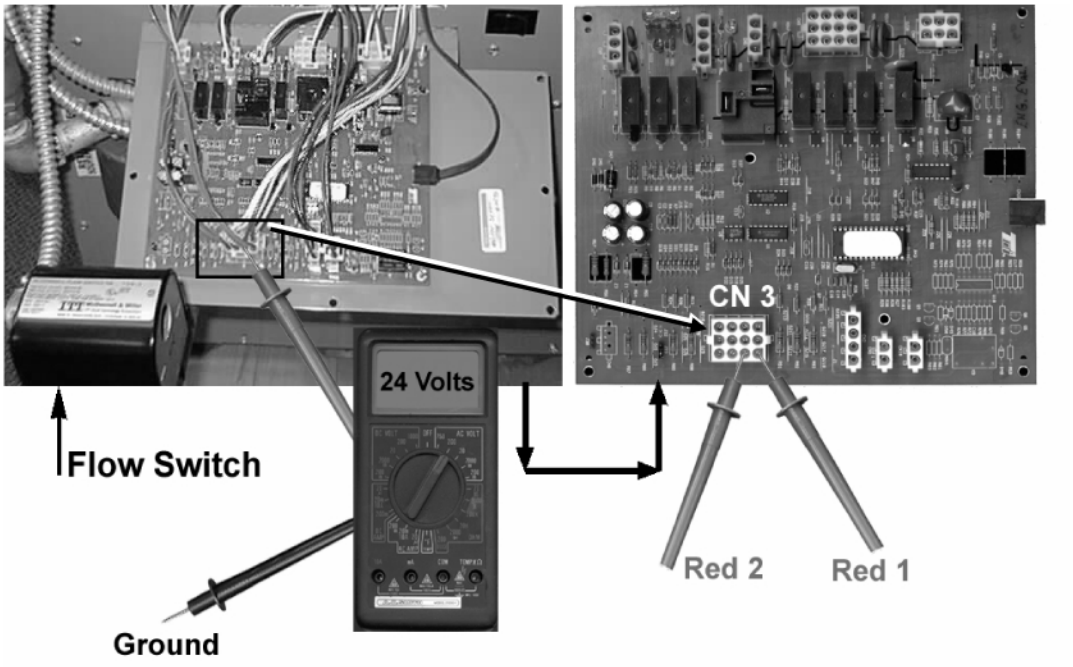
If …	then …
120VAC **is not present**	• check wires and their connections to plug CN9. • ensure that plug is okay and is inserted completely into receptacle. • replace control board.
120VAC **is present but** pump does not operate	• check wires and their connections to circulator. • replace circulator.
120VAC **is present** and pump operates	go to Step 9.

If Boiler is set for 3 trials for ignition (Jumper J 30 Not installed) Skip Steps 8-13 and begin with Step 8A on Page 42.

STEP 9 – FLOW SWITCH CHECK

Conditions

- "Call for Heat" – LED okay
- 12 Loc Out Sensor Fail
- Jumper J30 - Installed
- Multimeter set to test for 24 VAC
- Flow switch wires attached to board
- Test for 24 VAC through flow switch on CN3 terminal



STEP 9	FLOW SWITCH CHECK
	24VAC Test between each red wire connection on plug CN3 and ground.

If …	then …
24VAC **is not present** between either red wire connection and ground	• ensure plug is okay and inserted correctly into CN3. • replace control board.
24VAC **is present between only** (1) red wire connection and ground	• check wires and their connections to flow switch and CN3 plug. • check for obstruction in waterways, and/or verify that water is flowing. • adjust flow switch tension. • replace flow switch.
24VAC **is present** between each red wire connection and ground	• "Flow Switch" LED will be green (if not, check/replace interconnect cable and/or display board). • if still not okay, replace control board. • go to Step 10.

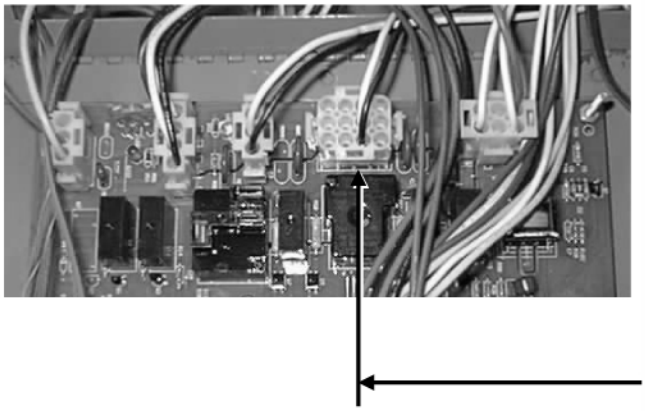
If Boiler is set for 3 trials for ignition (Jumper J 30 Not installed) Skip Steps 8-13 and begin with Step 8A on Page 42.

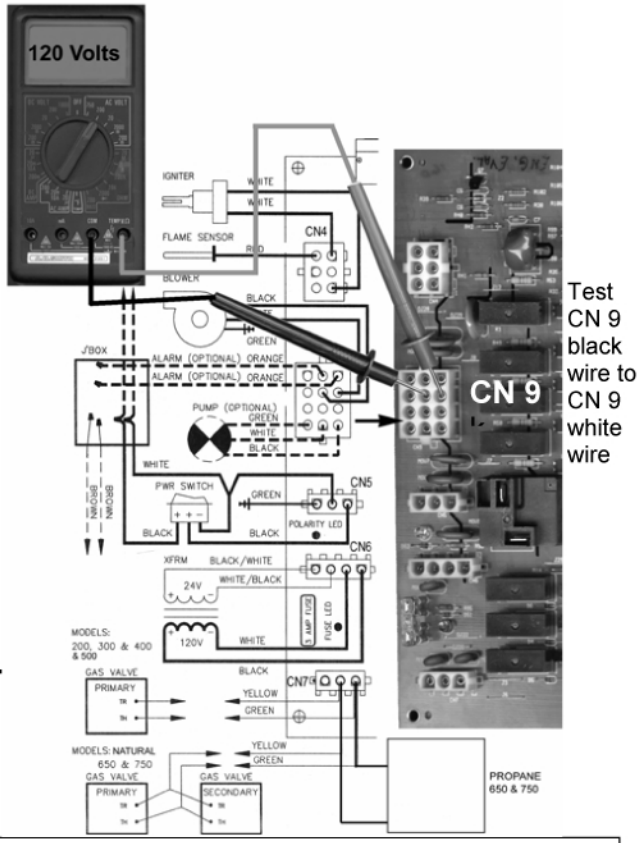
STEP 10 – POWER TO BLOWER CHECK

Condition:

- "Call for Heat" – L.E.D. "On"
- Ignition fail – L.E.D. "On"
- 1 Loc Out No Ignition
- Jumper J30 - Installed

- Test meter set to check 120 VAC
- CN 9 Plug connected to board





STEP 10	POWER TO BLOWER CHECK
	120 VAC test between CN9 black wire connection and CN9 white wire connection

If …	and…	then …
120VAC **is not present**		• check wires and their connections to plug CN9. • ensure plus is okay and is inserted completely into receptacle. • replace control board.
120VAC **is present**	blower **is not running**	• check wires and their connections. • replace blower.
120VAC **is present**	blower **is operating**	continue to Step 11.

If Boiler is set for 3 trials for ignition (Jumper J 30 Not installed) Skip Steps 8-13 and begin with Step 8A on Page 42.

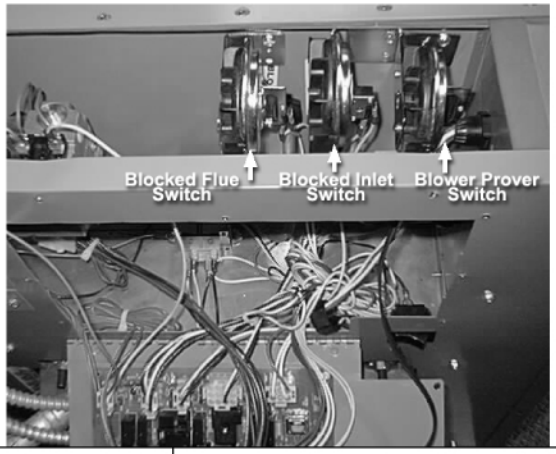
STEP 11 – BLOWER PROVER SWITCH CHECK

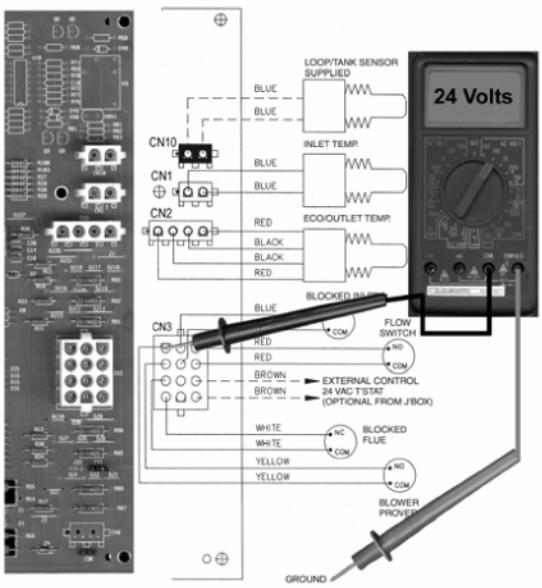
Conditions:

- "Call for Heat" – LED okay
- 8 Loc Out Sensor Fail
- Jumper J30 - Installed

A positive air pressure of at least 30" W.C. is necessary to close this Blower Prover Switch

- Plug connected to CN3 receptacle





STEP 11	BLOWER PROVER SWITCH CHECK
	Test for 24VAC from each yellow wire connection on plug CN13 and ground.

If …	then …
24VAC **is not present** between either yellow wire and ground	• check wire connections at plug CN3 and blower prover switch. • ensure plug is okay and is inserted completely into receptacle CN3. • replace control board.
24VAC **is present between only** one yellow wire connection and ground	• verify that at least .30" W.C. positive pressure exists (adjust blower air shutter if necessary). • replace blower prover switch.
24VAC **is present** between each yellow wire connection and ground	• "Pressure Switch" LED will be green. If not-check/replace interconnect cable and/or display board. • if still not okay, replace control board. • continue to Step 12.

If Boiler is set for 3 trials for ignition (Jumper J 30 Not installed) Skip Steps 8-13 and begin with Step 8A on Page 42.

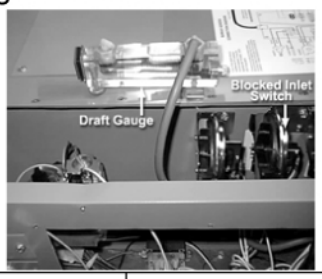
STEP 12 – BLOCKED INLET PRESSURE SWITCH CHECK

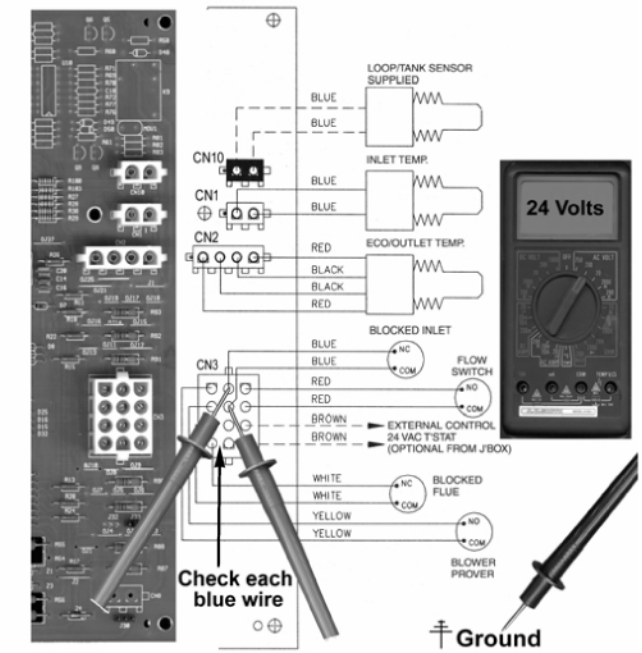
Condition:

- "Call for Heat" LED "On"
- 12 Loc Out Sensor Fail
- Jumper J30 - Installed

Note: This blocked inlet switch will open if a negative pressure equal to or more than .40" W.C. is created due to a blocked air intake

- Plug is connected to CN3 receptacle





STEP 12	BLOCKED INLET PRESSURE SWITCH CHECK
	CN3 terminal 24VAC check to each blue wire connection and ground.

If …	then …
24VAC **is not present** between either blue wire connection and ground	• check wires and their connections at plug CN3 and at blocked inlet pressure switch. • that plug is okay and is inserted completely into receptacle. • replace control board.
24VAC **is present between only** one blue wire connection and ground	• verify negative pressure equal to or more than 0.40" W.C. does not exist. • check intake piping (if applicable) for blockage or verify room air supply (if applicable) is adequate. • replace blocked inlet pressure switch.
24VAC **is present** between each blue wire connection and ground	• red "Blocked Inlet" LED will be off. • check/replace interconnect cable before replacing display board. • replace control board. • go to Step 13.

If Boiler is set for 3 trials for ignition (Jumper J 30 Not installed) Skip Steps 8-13 and begin with Step 8A on Page 42.

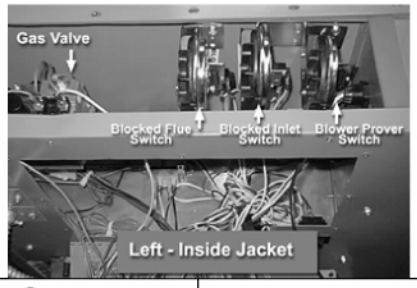
STEP 13 – BLOCKED FLUE PRESSURE SWITCH CHECK

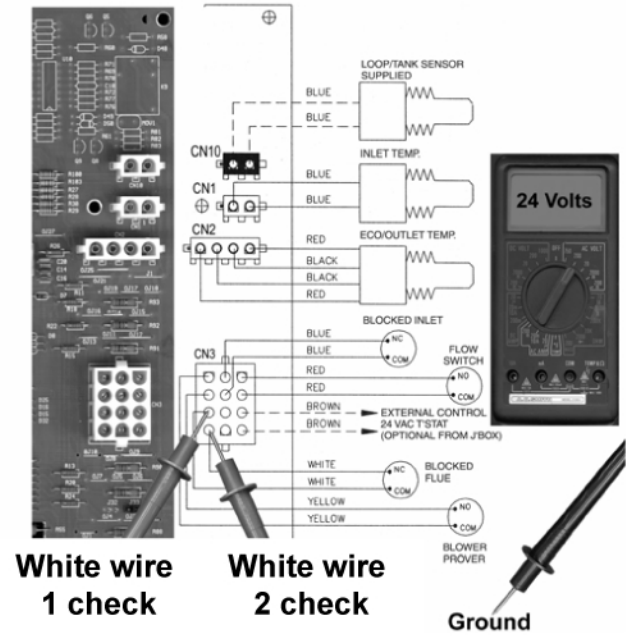
Condition:

- Call for heat L.E.D. "On"
- 8 Loc Out sensor fail
- Jumper J30 - Installed

Note: A positive air pressure equal to or more than .20" W.C. is necessary to open this Blocked Flue switch

- Blower is operating
- Wires are connected to CN 3





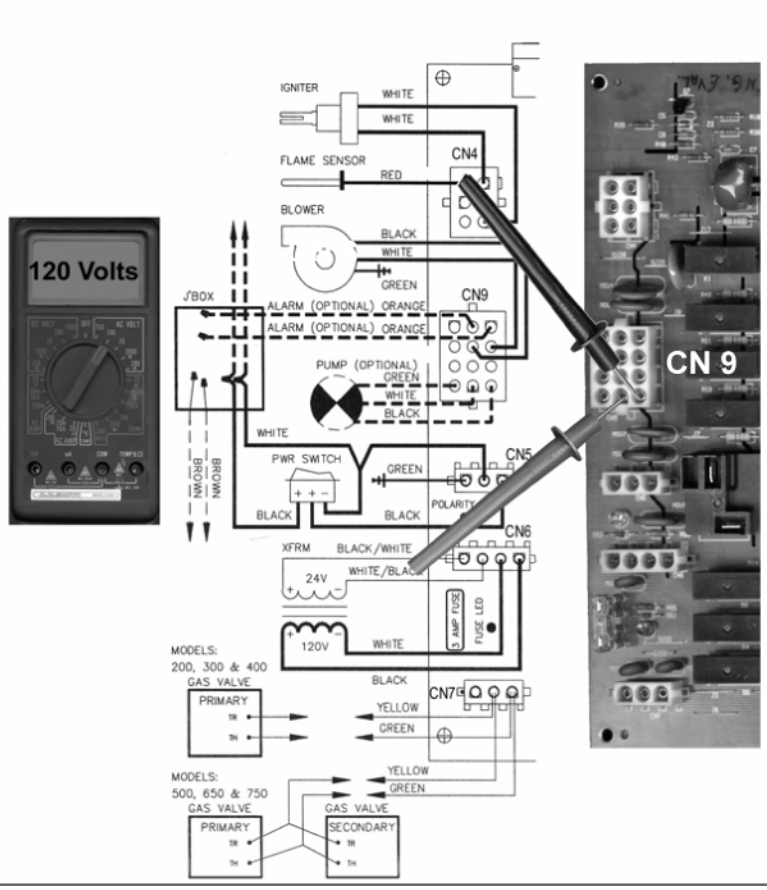
STEP 13	BLOCKED FLUE PRESSURE SWITCH CHECK
	24V between each white wire connect to ground on plug CN3 and ground.

If …	then …
24VAC **is not present** between either white wire connection and ground	• check wire connections. • ensure that plug is okay and is inserted completely into receptacle CN3. • replace control board.
24VAC **is present between only** one white wire connection and ground	• check wire connections at switch. • verify that a positive pressure equal to or more than .20" W.C. does not exist. • check for blockage in exhaust piping. • replace switch.
24VAC **is present** between each white wire connection and ground	• red "blocked flue" LED – "OFF" • check/replace interconnect cable before replacing display board. • if still not okay, replace control board. • go to Step 14.

STEP 8A – 120 VAC POWER TO PUMP CHECK - NO J30 JUMPER

Conditions:

- "Call for Heat" – LED "ON"
- 6 Loc Out Circulation Fail
- Plug connected to CN9 receptacle



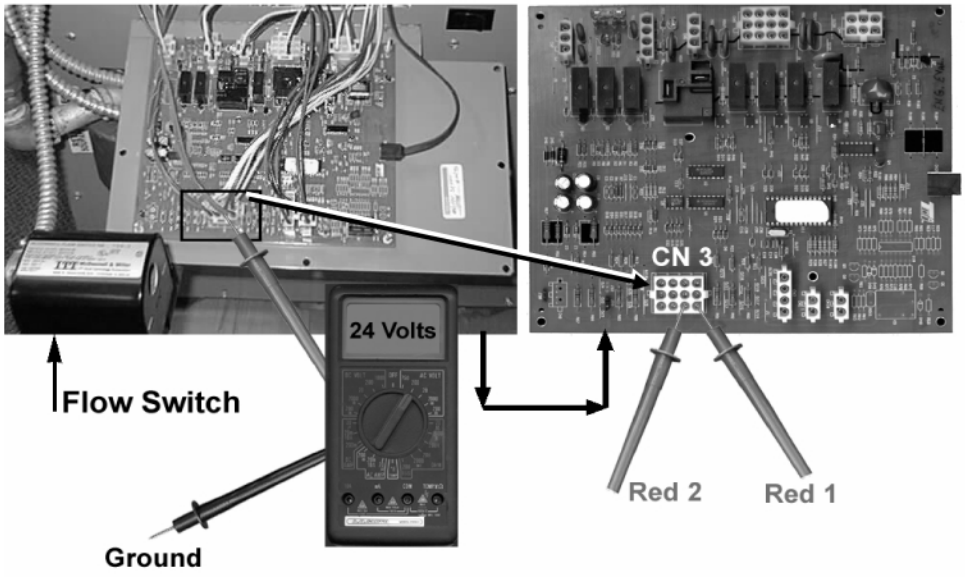
STEP 8A	**120VAC POWER TO PUMP CHECK**
	Test between black and white terminals on plug CN9.

If …	**then …**
120VAC **is not present**	• check wires and their connections to plug CN9. • ensure that plug is okay and is inserted completely into receptacle. • replace control board.
120VAC **is present but** pump does not operate	• check wires and their connections to circulator. • replace circulator.
120VAC **is present** and pump operates	go to Step 9A.

STEP 9A – FLOW SWITCH CHECK - NO J30 JUMPER

Conditions

- "Call for Heat" – LED "ON"
- 6 Loc Out Circulation Fail
- Multimeter set to test for 24 VAC
- Flow switch wires attached to CN3
- Test for 24 VAC through flow switch on CN3 terminal



STEP 9A	FLOW SWITCH CHECK
	24VAC Test between each red wire connection on plug CN3 and ground.

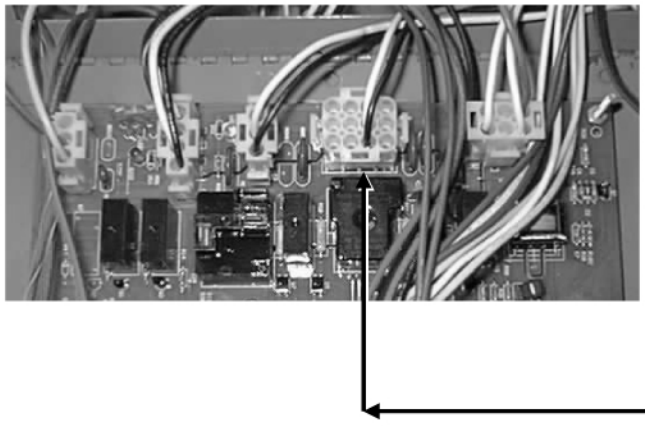
If …	then …
24VAC **is not present** between either red wire connection and ground	• ensure plug is okay and inserted correctly into CN3. • replace control board.
24VAC **is present between only** (1) red wire connection and ground	• check wires and their connections to flow switch and CN3 plug. • check for obstruction in waterways, and/or verify that water is flowing. • adjust flow switch tension. • replace flow switch.
24VAC **is present** between each red wire connection and ground	• "Flow Switch" LED will be green (if not, check/replace interconnect cable and/or display board). • if still not okay, replace control board. • go to Step 10A.

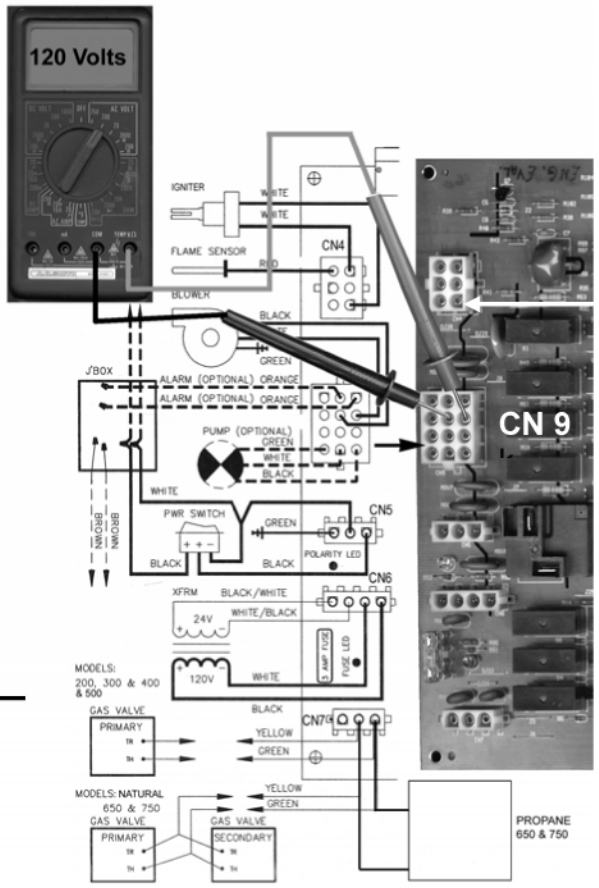
STEP 10A – POWER TO BLOWER CHECK - NO J30 JUMPER

Condition:

- "Call for Heat" – LED "ON"
- 7 Loc Out Inducor Fail

- Plug connected to CN9 receptacle





STEP 10A	POWER TO BLOWER CHECK
	120VAC test between CN9 black wire connection and CN9 white wire connection.

If …	and…	then …
120VAC **is not present**		• check wires and their connections to plug CN9. • ensure plus is okay and is inserted completely into receptacle. • replace control board.
120VAC **is present**	blower **is not running**	• check wires and their connections. • replace blower.
120VAC **is present**	blower **is operating**	continue to Step 11A.

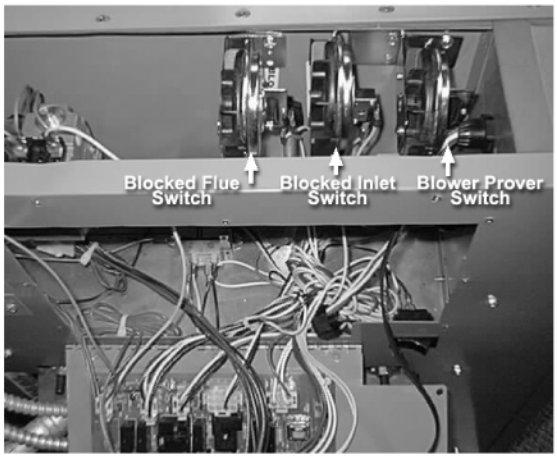
STEP 11A – BLOWER PROVER SWITCH CHECK - NO J30 JUMPER

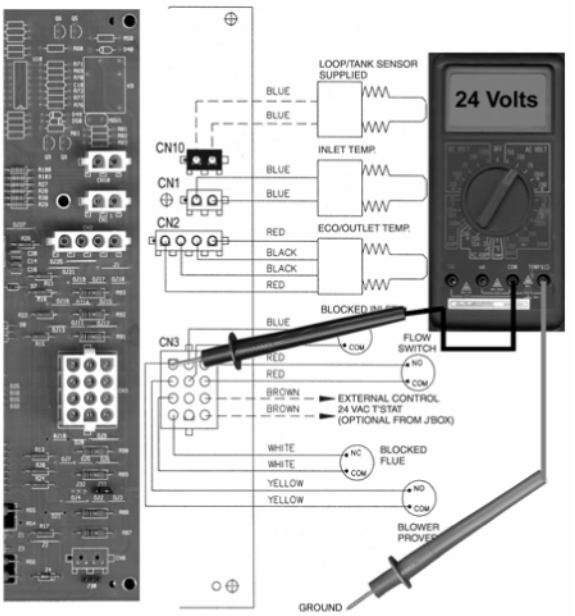
Conditions:

- "Call for Heat" – LED "ON"
- 7 Loc Out Inducer Fail

A positive air pressure of at least .30" W.C. is necessary to close this Blower Prover Switch

- Plug connected to CN3 receptacle





STEP 11A	BLOWER PROVER SWITCH CHECK
	Test for 24VAC between each yellow wire connection on plug CN3 and ground.

If …	then …
24VAC **is not present** between either yellow wire and ground	• check wire connections at plug CN3 and blower prover switch. • ensure plug is okay and is inserted completely into receptacle CN3. • replace control board.
24VAC **is present between only** one yellow wire connection and ground	• verify that at least .30" W.C. positive pressure exists (adjust blower air shutter if necessary). • replace blower prover switch.
24VAC **is present** between each yellow wire connection and ground	• "Pressure Switch" LED will be green. If not-check/replace interconnect cable and/or display board. • if still not okay, replace control board. • continue to Step 12A.

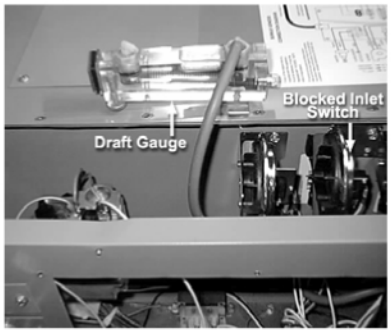
STEP 12A – BLOCKED INLET PRESSURE SWITCH CHECK - NO J30 JUMPER

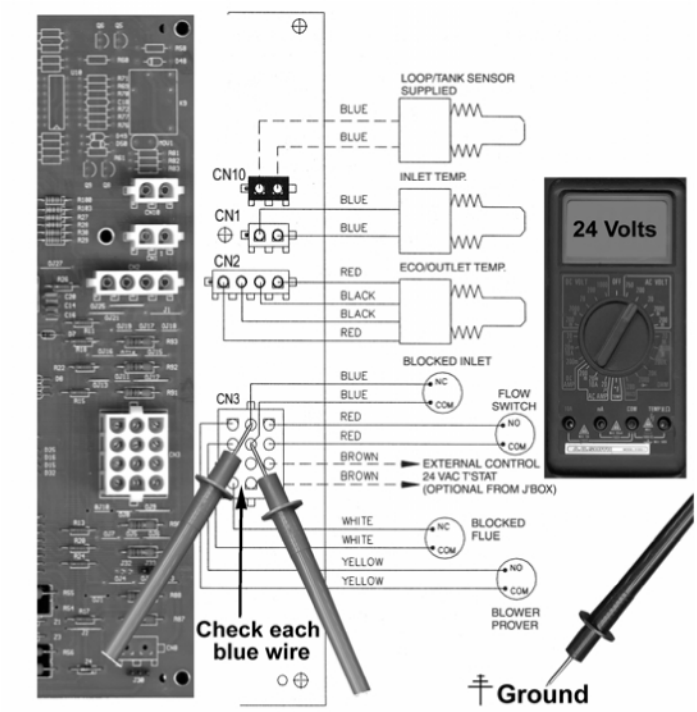
Condition:

- "Call for Heat" LED "ON"
- 6 Loc Out Circulation Fail

Note: This blocked inlet switch will open if a negative pressure equal to or more than .40" W.C. is created due to a blocked air intake

- Plug is connected to CN3 receptacle





S T E P 12A	BLOCKED INLET PRESSURE SWITCH CHECK
	CN3 terminal 24VAC check between each blue wire connection on plug CN3 and ground.

If …	then …
24VAC **is not present** between either blue wire connection and ground	• check wires and their connections at plug CN3 and at blocked inlet pressure switch. • ensure that plug is okay and is inserted completely into receptacle. • replace control board.
24VAC **is present between only** one blue wire connection and ground	• verify negative pressure equal to or more than 0.40" W.C. does not exist. • check intake piping (if applicable) for blockage or verify room air supply (if applicable) is adequate. • replace blocked inlet pressure switch.
24VAC **is present** between each blue wire connection and ground	• red "Blocked Inlet" LED will be off. If not, • check/replace interconnect cable before replacing display board. • replace control board. • go to Step 13A.

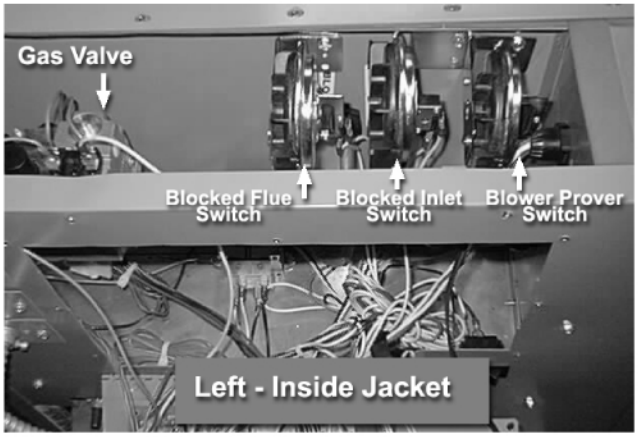
STEP 13A – BLOCKED FLUE PRESSURE SWITCH CHECK - NO J30 JUMPER

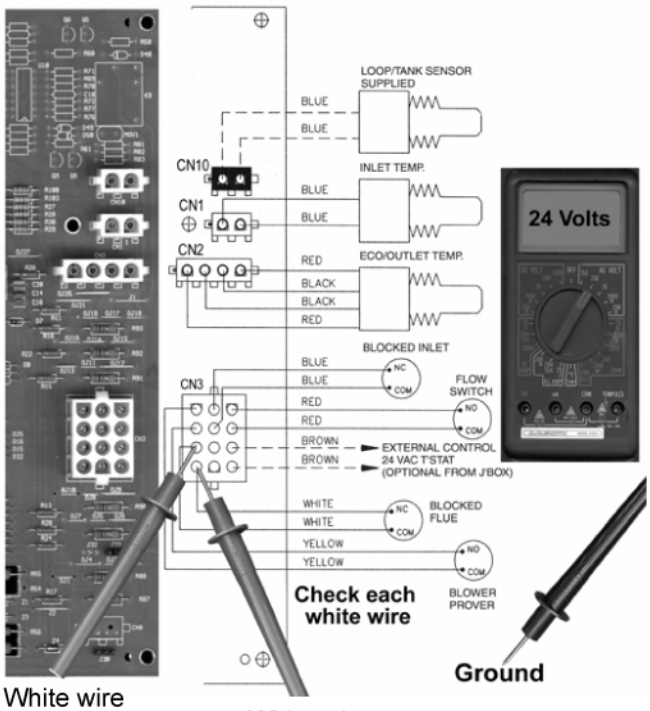
Condition:

- "Call for Heat" LED "ON"
- 5 Loc Out sensor fail

Note: A positive air pressure equal to or more than .20" W.C. is necessary to open this Blocked Flue switch

- Plug is connected to CN3





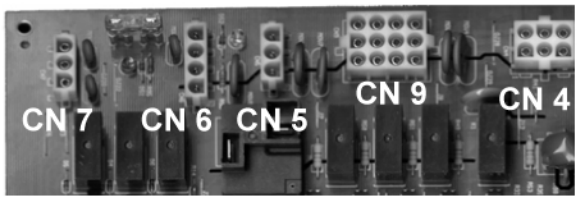
STEP 13A	BLOCKED FLUE PRESSURE SWITCH CHECK
	24VAC between each white wire connection on plug CN3 and ground.

If …	then …
24VAC **is not present** between either white wire connection and ground	• check wire connections. • ensure that plug is okay and is inserted completely into receptacle CN3. • replace control board.
24VAC **is present between only** one white wire connection and ground	• check wire connections at switch. • verify that a positive pressure equal to or more than .20" W.C. does not exist. • check for blockage in exhaust piping. • replace switch.
24VAC **is present** between each white wire connection and ground	• red "blocked flue" LED – "OFF". If not, • check/replace interconnect cable before replacing display board. • if still not okay, replace control board. • go to Step 14.

STEP 14 –IGNITER CHECK

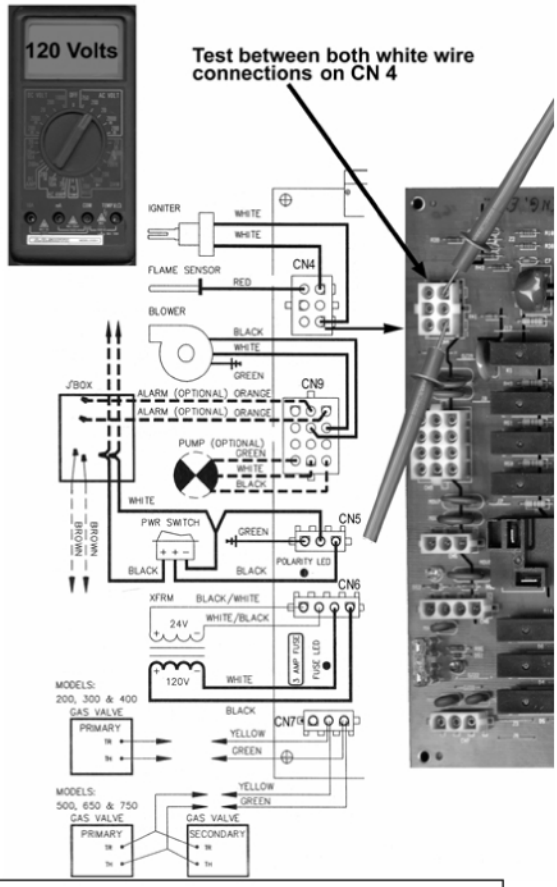
Condition:

- "Call for Heat" – LED "ON"
- "Igniter Fail" LED "ON"
- "2 Loc Out Igniter Fail" on display



*Resistance at room temperature: 40 – 70 Ω
Current at operating condition: 3.25A

Power "On" for 120VAC and current (amperage) check. Plug is in receptacle CN4 *Power "Off" plug removed from CN4 for resistance check.



S T E P 14	IGNITER CHECK
	Check for 120 VAC between white wire connects on CN4. This must be done during 17 second igniter heat up (after 20 second blower prepurge). **Also conduct amperage check and Ohms resistance check.**

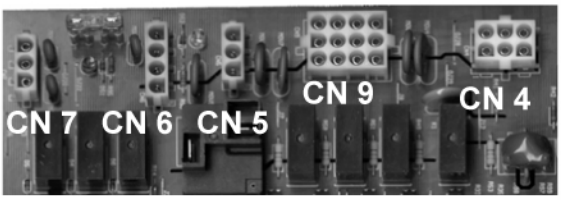
If …	then …
120 VAC **is not present**	• check connections to plug CN4. • replace control board.
120 VAC **is present but** no ignition occurs	• check igniter resistance* and current (amperage). • replace igniter.
120 VAC **is present**, and ignition occurs	• green "Igniter Current" - "ON". } If not, check/replace interconnect cable and/or display board. • red "Igniter Current - "OFF" . } • if still not okay, replace control board. • igniter heats. • go to Step 15.

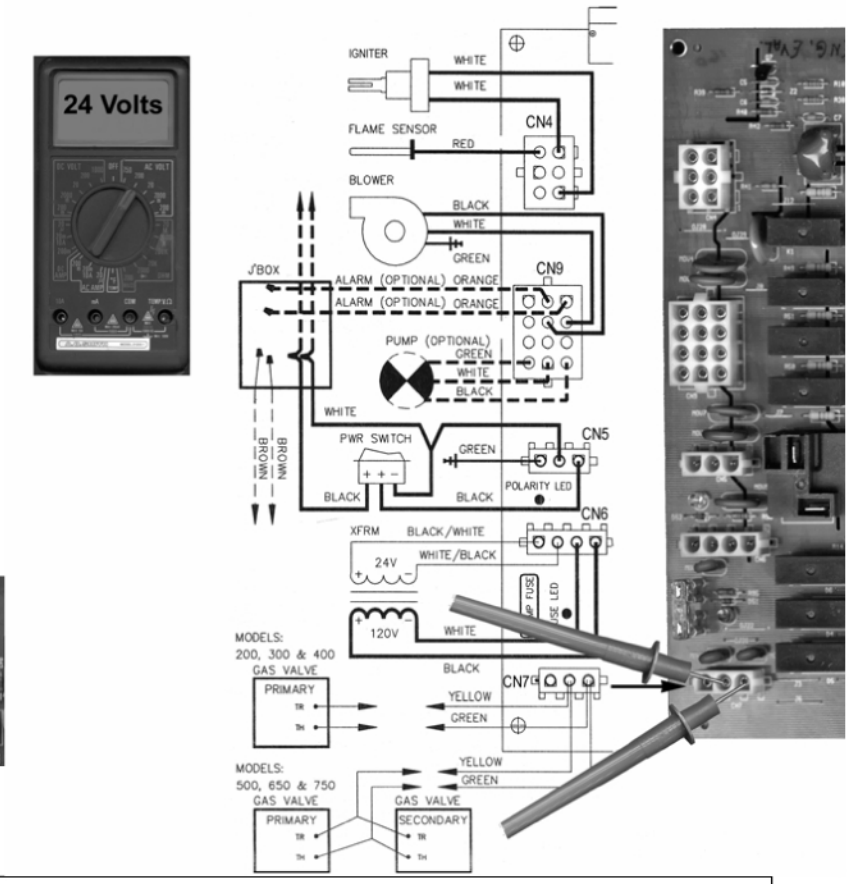
STEP 15 – VOLTAGE TO THE GAS VALVE CHECK

Condition:

- "Call for Heat" LED "ON"
- "Igniter Fail" LED "ON"
- 1 Loc Out no ignition

- Plug is connected to CN7 receptacle





STEP 15	VOLTAGE TO THE GAS VALVE CHECK
	Test for 24VAC on CN7 plug – yellow wire to green wire on plug. Must be checked during 4 second trial for ignition.

If …	then …
24 VAC **is not present**	• check wires and their connections to plug CN7. • replace control board.
24 VAC **is present**	• green "Gas Valve" LED "ON" (during 4 sec. valve opening. • check/replace interconnect cable before replacing display board. • if still not okay, replace control board. • check wires and their connections to gas valve. • go to Step 16.

STEP 16 – OHMS RESISTANCE CHECK OF GAS VALVE COIL

Condition:

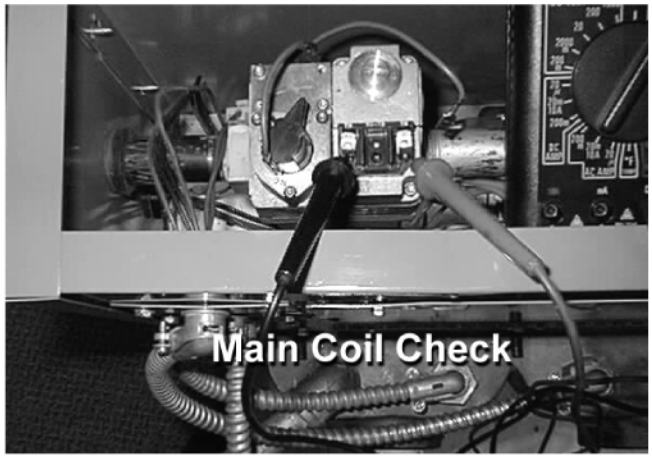
- "Call for Heat" LED "ON"
- 5 Loc Out sensor fail

Note: A positive air pressure equal to or more than .20" W.C. is necessary to open this Blocked Flue Switch

N P	200, 300	61.7 ± 10%	18.5 ± 10%
N P	400, 500	72 ± 5%	16.5 ± 5%
N	650, 750	36.2 ± 5%	36.2 ± 5%
N			
P		23.2 ± 5%	23.2 ± 5%

- **Turn off power to the heater**
- Disconnect wires to the gas valve

Genesis Gas Valve



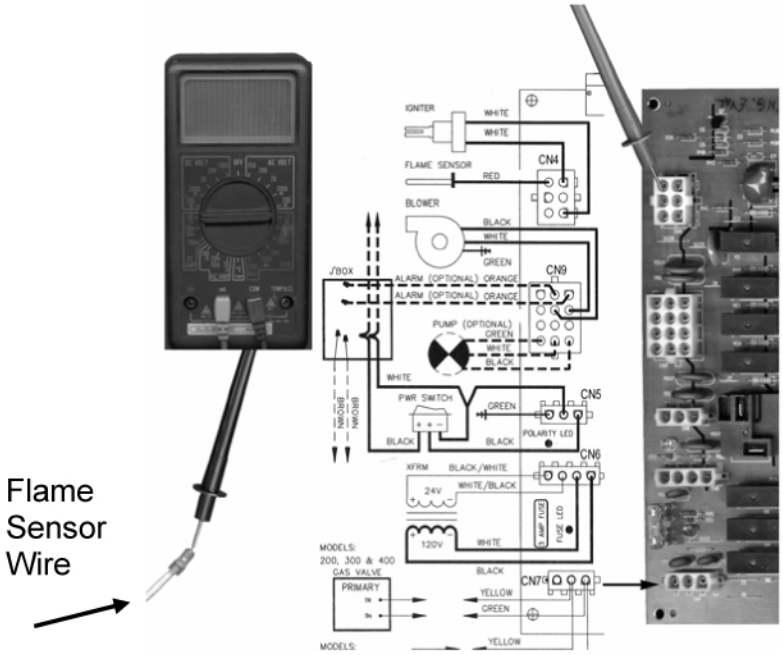
STEP 16	OHMS RESISTANCE CHECK OF GAS VALVE COIL(S)
	Test between the two terminals of the main and safety gas valve coils or the two wire ends of the safety coils.

If …	then …
the resistance **is not** the table's listed Ohms	replace the gas valve.
the resistance **is** at the table's listed Ohms	• green LED "Gas Valve" "ON" (during 4 second valve opening). • check/replace interconnect cable before replacing display board. • if still not okay, replace control board. • replace control board. • go to Step 17.

STEP 17 – FLAME SENSING CHECK

Condition:

- "Call for Heat" LED "ON"
- "Igniter Fail" LED okay
- 1 Loc Out No Ignition



- Plug is connected to CN4 receptacle
- Multimeter set for DC micro-amp (1.0 u) test. Main burner flame must stay in contact with sensor to complete circuit

STEP	**17**	**FLAME SENSING CHECK** **Disconnect the red sensor wire from CN4 (and reconnect plug).**
		Connect meter in series from wire end to plug in CN4. **Signal will be present only after main burner ignites.**

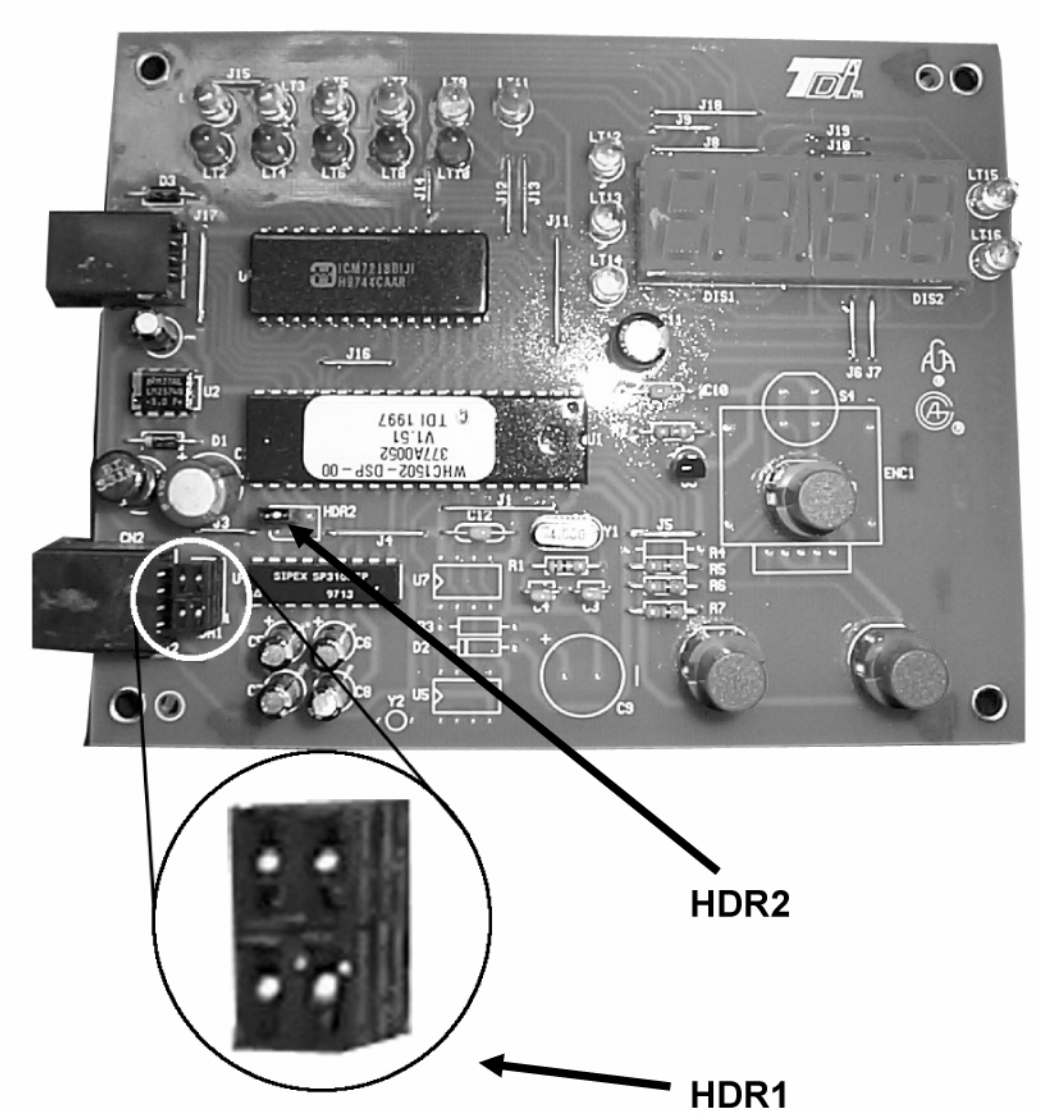
If …	**then …**
1.0 microAmp minimum i**s not detected** after burner ignites	• verify that flame is hitting sensor - view through sight glass. Adjust blower air shutter if necessary. • check sensor wire and its connection (behind front jacket panel). • replace sensor.
1.0 microAmp minimum **is present**	• green "Flame Sense" LED "ON" . If not, - check/replace interconnect cable before replacing display board. • replace the control board if the main burner shuts off. After all of these steps, if main burners ignites and flame is properly sensed, the heater will work.

GENESIS DIA-SCAN II DISPLAY JUMPERS

There are two jumpers on the Dia-Scan II display board for the Genesis 200-750 boilers.

The first jumper is actually a set of jumpers; the **HDR1** jumpers. These are reconfigured from the factory default setting only when a customer uses the optional Remote Display Board available.

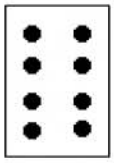
Also depending on whether the customer wants to restrict boiler output water temperature at 210 or 240 degrees via the Outlet Set Point (which acts like a automatic reset, or operating high limit switch) there is another jumper on the Dia-Scan II Display circuit board that will effect this change; the **HDR2**.



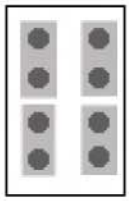
HDR1 JUMPER (LOCAL OR REMOTE DISPLAY)

There is a HDR1 "set" of jumpers that will need to be reconfigured when using the Dia-Scan II Remote Display Board. There are 8 HDR1 pins and 4 jumpers, by default the four jumpers are set vertically on the pins as in the pictures below for Local Display (this is the way all Genesis and Legends would ship).

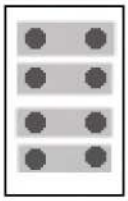
If the customer orders the Remote Display Kit these four jumpers would be reconfigured to fit across the 8 pins horizontally thereby enabling the Remote Display Board.



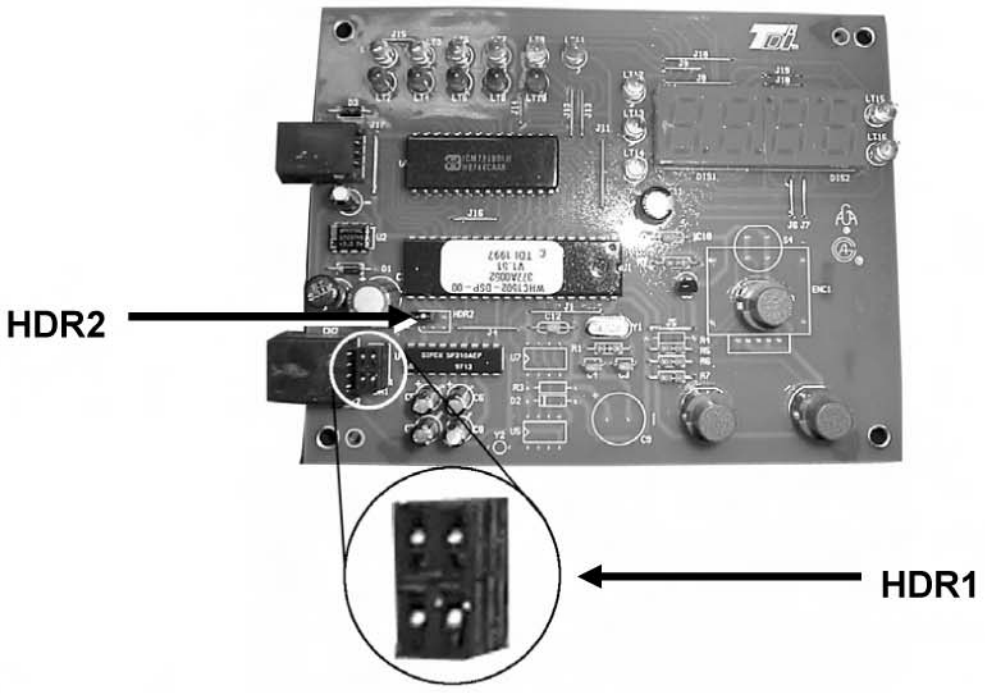
HDR1



Local



Remote



HDR2 Jumper (Outlet Temperature Limit)

Jumper is "On" for 210° F operating High Limit maximum.

Jumper is "Off" for 240° F operating High Limit maximum.

GENERAL INFORMATION
GW/GB 200 – 750 Series 200-203

Error Message	Reported Error
OPEn InLEt ProbE	No probe detected at connector CN1 on Control Board.
OPEn OutLEt ProbE	No probe detected at connector CN2 on Control Board.
Circulation FAIL	No flow detected at flow switch.
Inducer FAIL	No pressure detected at pressure switch.
FLAmE SenSE FAIL	Flame sense detected before gas valve is turned on.
SenSor FAIL	One of the sensors, Flow, Pressure, Hi Gas, or Lo Gas was not in the correct state.
Ignitor FAIL	No Ignitor current sensed.
No Ignition	Flam not detected after 3 (or 1) tries.
ECO FAIL	ECO/High Limit switch opened.
Control FAIL	Relay did not open or close properly.

Approximate Water Content	
Model GW/GB	Total Gallons
200 – 400	1.8
500 – 750	2.6

Approximate Operating Results	
NOx	7ppm – 8 ppm
CO	0 ppm – 100 ppm
CO_2	7.25% - 8.25% Natural
CO_2	8.0% - 9.75% Propane
Flue Temperature	275° - 375° F.

Electrical	120 VAC, 60 Hz, 20 Amp breaker recommended. Actual draw should not exceed 10 Amps.

Switches		
Type	AOS Pt. Number	Characteristics
Water Flow	210176	N.O. – Adjustable close setting
Blower Prover	210908-1	N.O. – Closes @ .30±.04” W.C.
Blocked Flue	210908-0	N.C. – Opens @ .20± .04” W.C.
Blocked Air Intake	210909	N.C. – Opens @ -.40± .05” W.C.

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GENESIS

Installation Notes:

1. If venting horizontally or direct venting, AL29-4C vent material must be used.
2. Do not combine vent of Genesis models with another heater or appliance when they are installed as Category III.
3. Exhaust vent draft must be maintained between -.02 and -.04" W.C. when venting as Category I (vertical, non-direct).
4. GW models with storage tank installations.
   If heavy usages or extended periods of condensation forming on the heat exchanger are anticipated, feed warmer water from the upper part of the tank to the heater.
5. Tank temperature control:
   A thermistor type probe is provided with GW models for tank temperature sensing. If this sensor is used, be sure that the jumper is installed on the J33 terminal of the control board.
   This jumper is not installed if a 24 VAC tank temperature control is used.
6. For 3 trial operation with 20 second intervals, J30 jumper on control board is not installed. If jumper is installed, 1 trial (part of CSD-1 requirement) will occur – See page 57 for CSD-1 information.
7. Remote Control Panel – A second display panel is available for remote monitoring. This display may be installed up to 1,000 feet from the heater. The wiring would plug into the heater display board. All functions of the heater display board would be available at the remote board.
8. See the Boiler's Instruction manual for maintenance information and suggestions.
9. See the PSD Parts List, provided with the boiler, for replacement parts.
10. Two Genesis boilers can be installed to supply hot water to one storage tank.
11. Even a small amount of voltage flowing through the "neutral" wire may cause erratic or no operation of the Genesis.
12. A poorly grounded Genesis may result in unusual voltage indications on some tests.

CSD-1 GENESIS

CSD-1 Genesis versions apply to GB/GW-500 through 750 models. In addition to the standard design, CSD-1 versions employ a low gas pressure switch, a high gas pressure switch and a single trial for ignition (J30 Jumper must be installed).

CSD-1 Low Gas Pressure Switches	
Model #	**Description**
GB/GW-500 through 750 (Natural)	N.C. setting 5.0” W.C. ± .4”
GB/GW-500 through 750 (Propane)	N.C. setting 10.5” W.C. ± 1.0”

CSD-1 High Gas Pressure Switches	
Model #	**Description**
GB/GW-500 through 750 (Natural)	N.C. setting 5.25” W.C. ±/- 0.4”
GB/GW-500 through 750 (Propane)	N.C. setting 12.8” W.C. ± 1.0”

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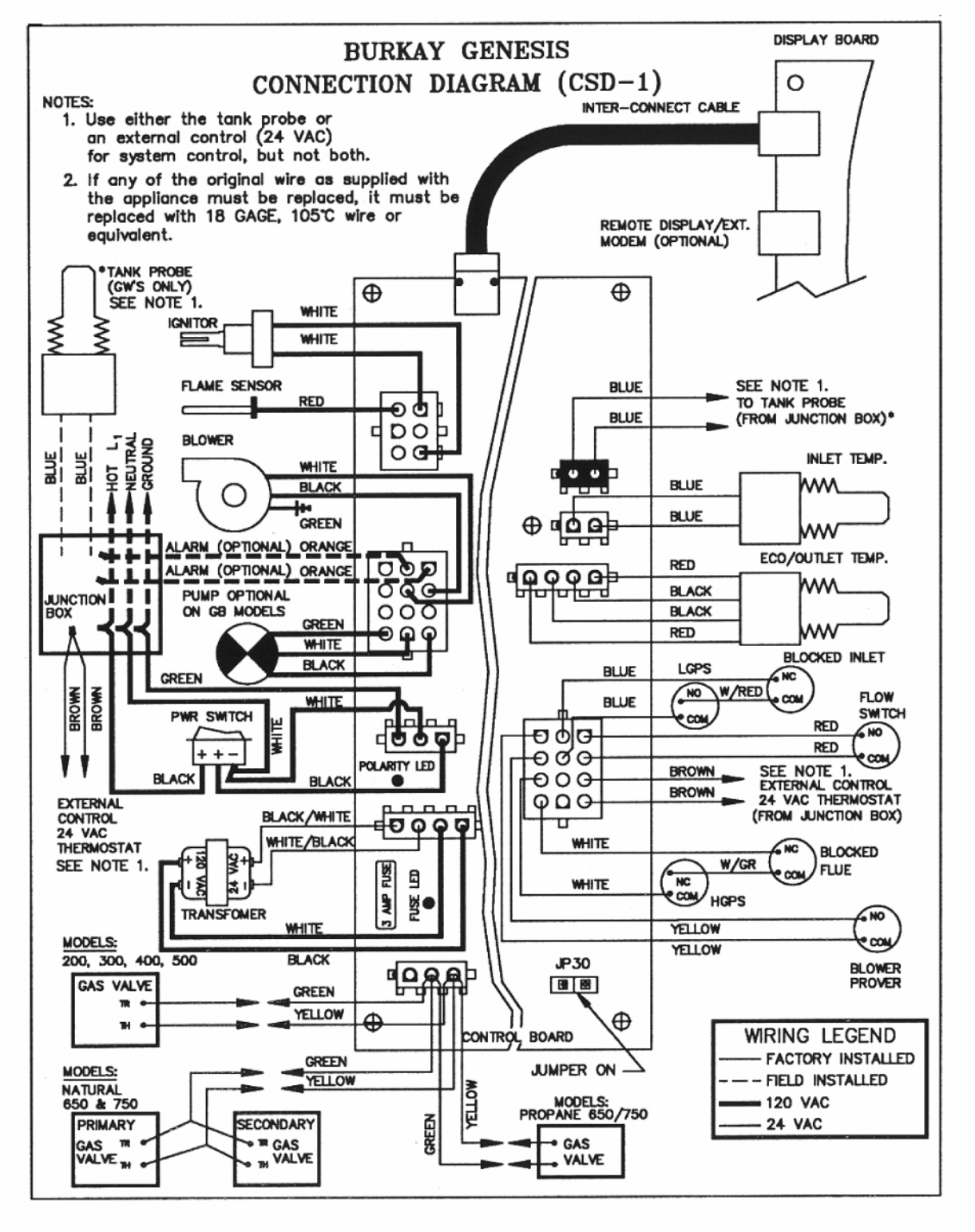
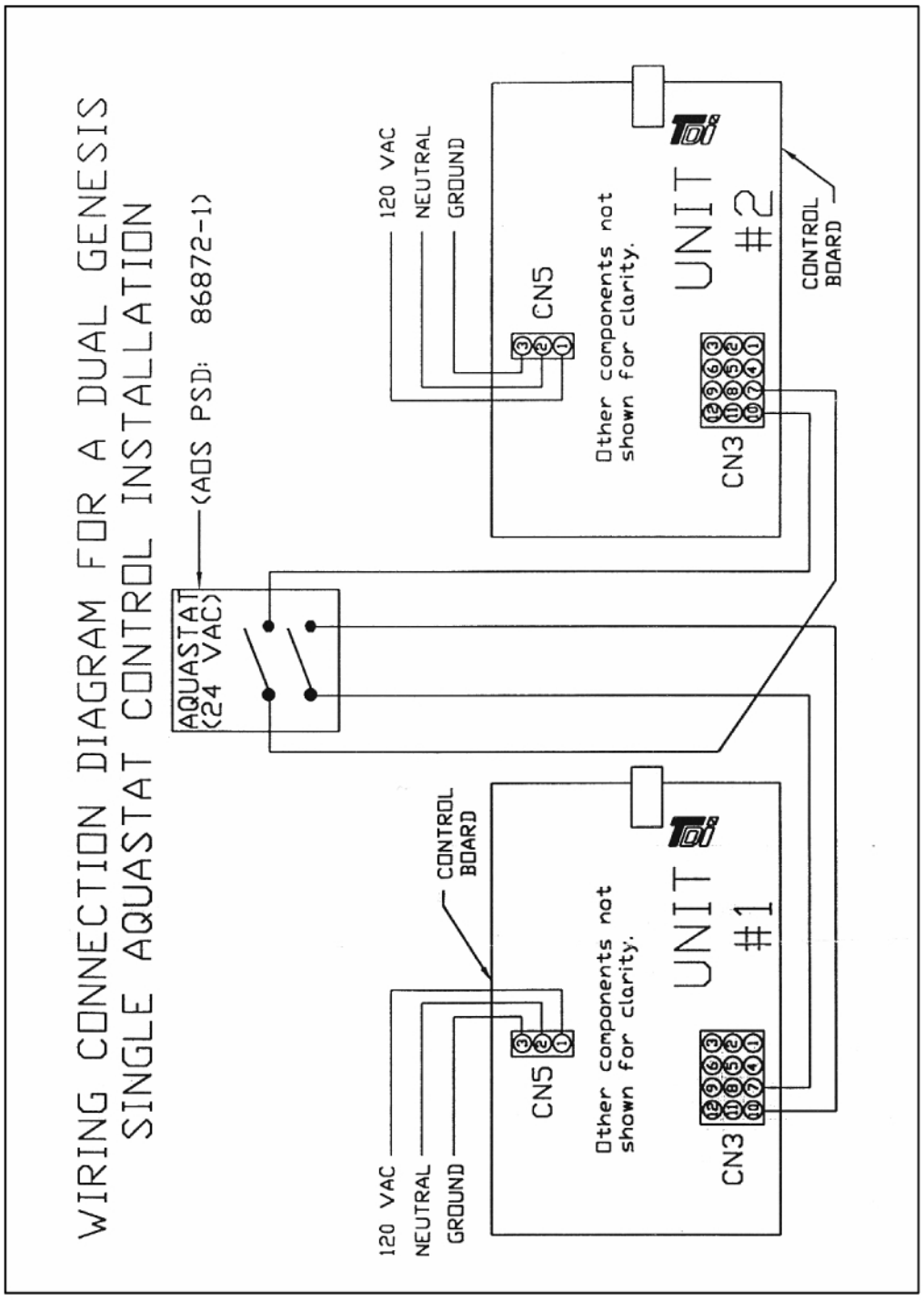
CSD-1 DIAGRAM



WIRING DIAGRAM FOR DUAL GENESIS SINGLE AQUASTAT CONTROL



GENESIS SERIES 200 I.R.I. MODELS

GENERAL

The GENESIS Hot Water boilers, when constructed, installed, operated and maintained in accordance with the provisions set forth in this insert along with the standard Instruction Manuals, are said to be in compliance with the Industrial Risk Insurers (IRI) position for a water tube boiler. The boiler is built in accordance with the ASME boiler and pressure vessel code and the IRI IM.4.1.2 information which references and modifies sections of the ANSI/NFPA 8502 and the ANSI/NFPA 85C standards. This insert sheet is intended to supplement the Instruction Manual set supplied with the boiler.

The importance of a well maintained boiler installation is recognized by insurance companies. Where a plant does not have a sufficient staff trained in the complete maintenance of its boiler, a maintenance contract should be established with the boiler company or an organization which is knowledgeable regarding the boiler and all subsystems associated with it. Operation, maintenance and inspection should be in accordance with the National Boiler Inspection Code unless otherwise superseded by local codes.

Figure 1 shows a typical IRI gas control train for GENESIS Hot Water Boiler models. The major components are identified by description. The gas control train uses two solenoid operated gas valves with position indicating switches and a separate gas pressure regulator to control the flow of gas to the main burner. The position indicating switches are monitored by the ignition module. A third solenoid valve located between the two larger valves is called a bleed or vent valve. The vent valve relieves any leakage through the seat of the first safety valve and prevents the development of pressure upon the seat of the second safety valve. This provides for additional security against fuel leakage into the combustion chamber when the burner is off. The vent valve is normally open and must be vented to the atmosphere according to the INSTALLATION instructions.

Figures 2 and 3 are the connection diagram and schematic diagram, respectively. These models have additional safety features in the circuit as compared to standard models. The primary differences are the addition of the high gas pressure switch, low gas pressure switch and low water cutoff to the circuit. The Dia-Scan II display module does not indicate the high gas pressure switch, low gas pressure switch or the low water cutoff. However, the ignition module will energize an alarm bell in the event of a failure. The boiler's operating sequence is controlled by the ignition module. The operating sequence, included, is similar to that of a standard Genesis boiler. The module is a single trial version with an alarm contact. Any failure that is sensed by a component in the safety circuit or the gas valve position indicating switches will cause the boiler to simultaneously shut down the gas valves while opening the vent valve, purge the combustion chamber, continuously sound the alarm and lock out. The power to the ignition module must be manually reset to restart the boiler.

GENESIS SERIES 200 I.R.I. MODELS (continued)

INSTALLATION

The gas control train has a main manual gas shutoff valve installed at the factory. A gas service pressure regulator is required to maintain a gas supply pressure below the maximum allowable pressure indicated on the appliance rating plate. A dirt leg shall be provided in the gas piping per the National Fuel Gas Code (NFPA 54).

Where required by the authority having jurisdiction, a fuel cleaning device such as a strainer or drip leg and a gas pressure relief valve should be installed, downstream of the gas service pressure regulator, in the gas supply line to the boiler.

The normally open bleed valve located between the two safety shut-off valves has a 3/4 inch NPT female threaded opening. This valve must be vented with a full size pipe run to a safe outside location. The vent line should have a maximum length of 50 feet and discharge to the outside atmosphere with consideration given to the density of the fuel gas.

Vent lines from gas regulators, switches and any other equipment requiring atmospheric pressure to balance a control diaphragm can be manifolded together. The manifolded line should have a cross sectional area not less than that of the largest vent line plus 50% of the area of the additional vent lines. For example, if the largest vent line is 1/4 inch and the vent line from the safety switch is 1/8 inch, the manifolded line should be 5/16 inch minimum. These vent lines **should not** be manifolded to the following:

Vent lines between the two safety shut-off valves.
Vent lines from the pressure relief valve if provided.
Vent lines from ignition or main burner systems.
Vent lines from other boilers.

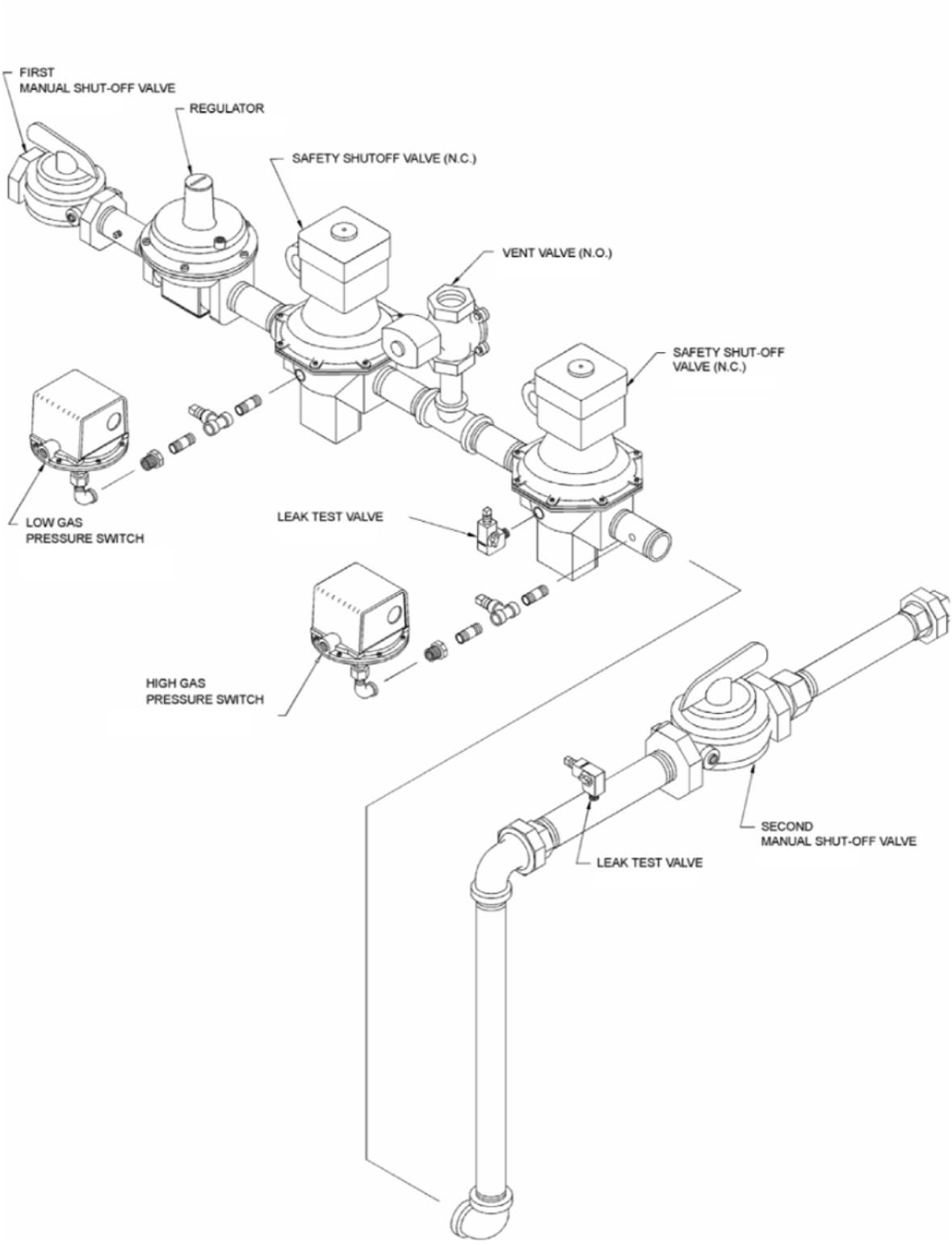
Vent lines between the two safety shut-off valves on the individual burner lines and the vent lines from the pressure relief valve, if provided, can be manifolded together. The cross sectional area of the manifolded line must not be less than that of the largest vent line plus 50% of the area of the additional vent lines. These vent lines **should not** be manifolded to the following:

Vent lines from the ignition or main burner systems.
Vent lines from other boilers.

A permanent means for making periodic tightness tests of the safety shut-off valves is provided with the appropriate leak test valves located on the downstream side of each safety shut-off valve. The boiler shall not be released for operation before the installation, checkout and start-up has been performed according to the Installation Instructions Manual, the Genesis Start-Up Instructions and this insert sheet.

TYPICAL I.R.I. GAS TRAIN

FIGURE 1



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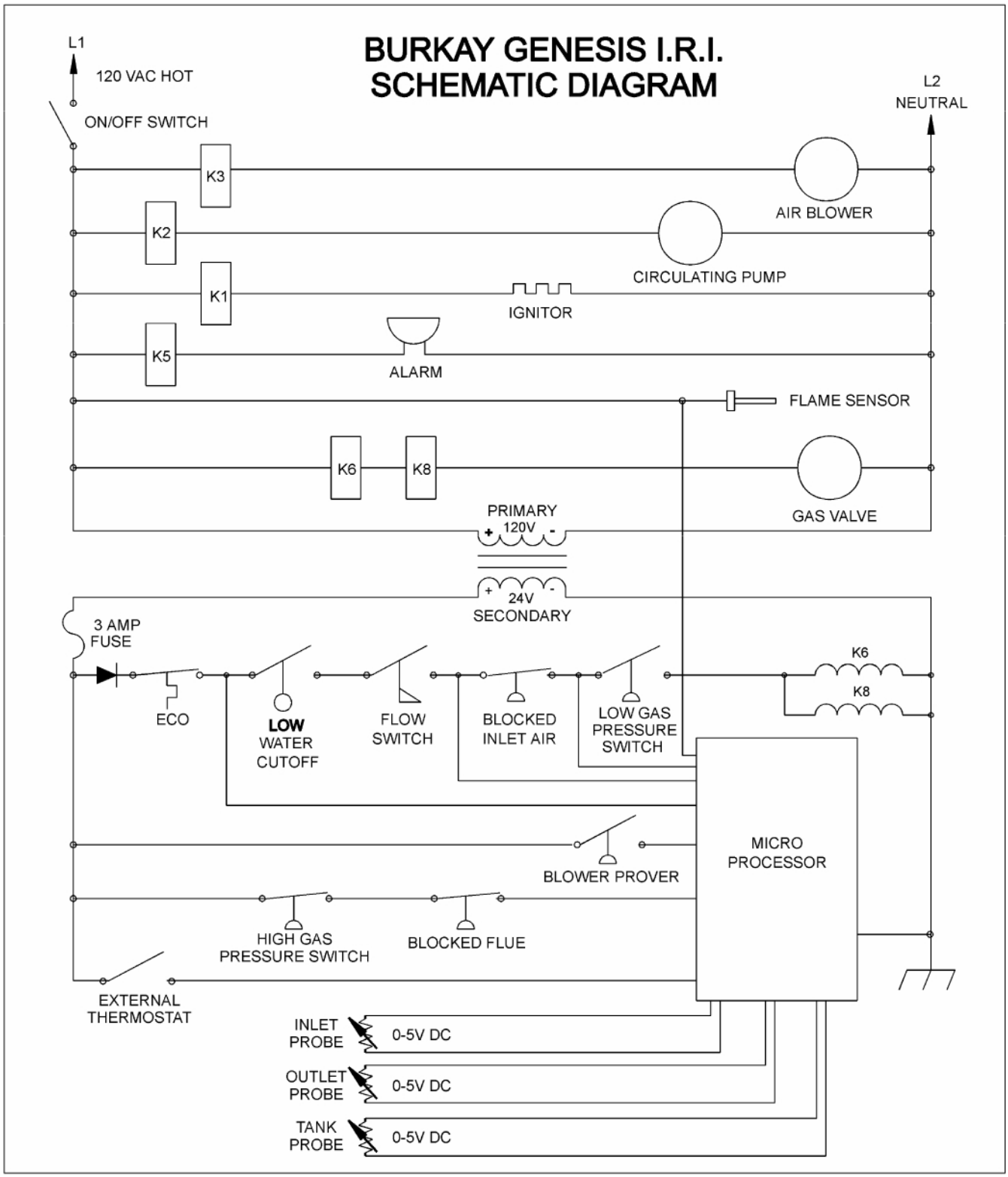
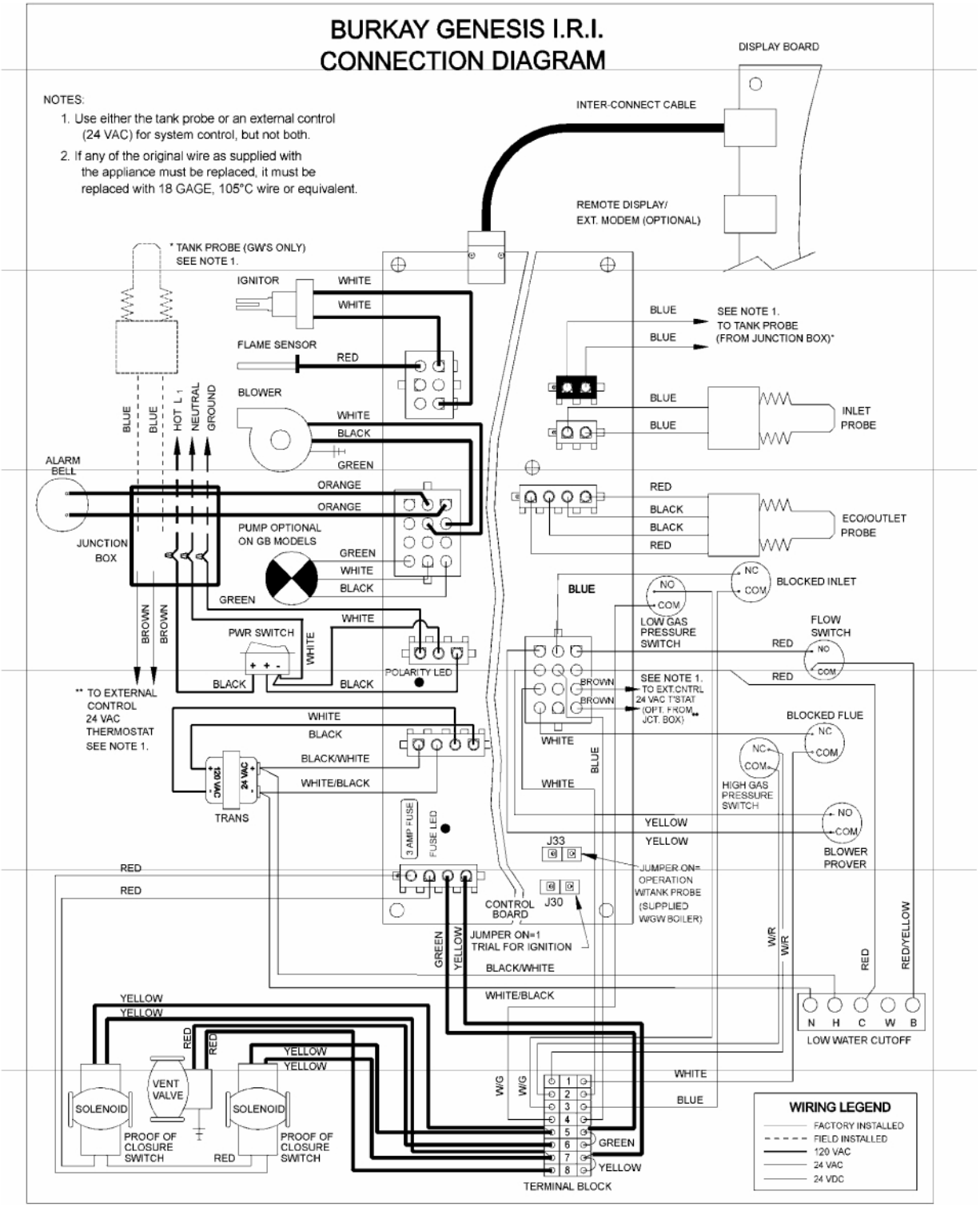
GENESIS I.R.I. SCHEMATIC DIAGRAM

FIGURE 2



GENESIS IRI CONNECTION DIAGRAM

FIGURE 3



GENESIS SERIES 200 I.R.I. MODELS (continued)

TESTING AND MAINTENANCE

The effective operation of all safety and control devices depends upon their ability to respond to their activating impulses. Therefore, it is important that they remain in proper operating condition at all times. An inspection and maintenance schedule should be established and performed on a periodic basis. During initial operation, more frequent inspection and maintenance may be necessary.

Precautions shall be taken to protect against bodily injury or property damage while tests are being conducted. Cover plates that require removal in order to gain access to items requiring maintenance or testing shall be replaced before the boiler is put back into service.

Operators or maintenance technicians should follow the recommended procedures set forth in the instructions and allow for any additional circumstances that arise based on the particular installation when preparing a maintenance program.

The operator or technician should thoroughly understand the operating procedures and recognize an equipment malfunction. Any defects found should be corrected immediately.

The table provided herein is a recommended guideline to follow for periodic testing of the boiler's safety devices and controls. Detailed maintenance procedures are included. The results of the periodic testing should be recorded in a suitable log book at the time of testing.

Item	Frequency	Accomplished By	Remark
1. Gages & Indicators	Daily	Operator	Visual inspection - log observations.
2. Burner Flames	Daily	Operator	Visually inspect for uniform blue flames.
3. Flame Signal Strength	Weekly	Operator	Check flame signal strength with meter and log
4. Flame Failure Detection	Weekly	Operator	Close Manual Shutoff Valve, check safety shutdown time - log observations.
5. Gas Valves	Weekly	Operator	Lower Dia-Scan II outlet temperature, setpoint until satisfied, listen for valve closu check for voltage.
6. Flow Switch / Low Water Cutoff	Weekly	Operator	See Installation Instructions.
7. Vent System	Monthly	Operator	See Installation Instructions.
8. Blocked Flue, Blocked Inlet and Blower Prover Pressure Switches	Monthly	Operator	See Installation Instructions.
9. Gas Pressure Switches	Monthly	Operator	See Installation Instructions.
10. Burners	Semiannually	Service Technician	See Installation Instructions.
11. Transformer	Semiannually	Service Technician	Check primary and secondary voltage, log observations.
12. High Limit and Outlet Temperature Setpoint	Annually	Service Technician	See Installation Instructions.
13. Safety Valves	As Required	Operator	See Installation Instructions.
14. Drip Leg & Gas Strainer	As Required	Operator	See Installation Instructions.

GENESIS SERIES 200 I.R.I. MODELS (continued)

TESTING AND MAINTENANCE INSTRUCTIONS

1. Dia-Scan II indicators should be visually inspected on a daily basis for normal operation of boiler. The temperature indicators should be inspected and the differential temperatures recorded while the boiler is firing. If the temperature differential increases by five degrees from the time the boiler was first put into service, a general deliming of the heat exchanger may be in order. The initial temperature differential should be established per the procedures in the Installation Instructions manual.

2. Visually inspect the flame through the observation port for a uniform blue flame.

3. The flame signal strength may be checked by placing a digital multimeter in series with the sensor lead. Once the boiler has established a flame, a signal of at least one microamp should be indicated. If a weaker signal is present then the flame may not be impinging on the sensor properly. To check for a faulty igniter the cold resistance is measured by shutting the boiler down and allowing the igniter to cool to room temperature. The igniter leads are then disconnected and an Ohm meter is hooked up across the leads. The resistance value should be in the range of 40-70 Ohms.

4. If a flame failure is detected, the boiler should shut off within one second. This may be accomplished by closing the manual shutoff valve just ahead of the gas manifold, checking for gas valve closure and timing by watching the Dia-Scan II indicator or checking voltage at the gas valve.

5. Lower the outlet temperature setpoint momentarily until “satisfied”. Listen for valve closure and verify no voltage to either valve. Return the outlet temperature setpoint to its normal setting.

6. The flow switch may be tested by verifying switch position when water is flowing through the system and when flow ceases. With water flowing through the system, the circuit between the Common and Normally Open terminals on the switch will be closed. When water flow drops or ceases in the system, the circuit between the Common and Normally Open terminals will be open. These two conditions may be verified with a continuity meter. The low water cutoff can be tested by checking for continuity between terminals B and C. With no water present there should be no continuity.

7. The vent system shall be maintained per the Venting Maintenance section in the Installation Instructions Manual.

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GENESIS SERIES 200 I.R.I. MODELS (continued)

8. The blocked flue switch contacts may be opened by applying a positive pressure equal to or greater than 0.2" W.C. to the barbed fitting. The boiler will shut down if running or not start up. The blocked inlet switch contacts may be opened by blocking off air at the inlet of the unit. The contacts will open at a vacuum pressure of 0.4" W.C. The boiler will shut down if running or not start up. The blower prover switch may be checked by disconnecting the tube at its barbed fitting. The boiler will shut down if running or not start up. A manual reset of power to the boiler is required to start up again.

9. The low gas pressure switch contacts may be opened by closing the manual shutoff valve in the gas supply to the boiler. The boiler will shut down if running or not start up. The high gas pressure switch requires an increase in gas pressure in order for its contacts to be opened. The boiler will shut down if running or won't start if gas pressure in excess of 1 1/2 times its normal manifold pressure is applied at its connecting port. A shut-down on any of the switches in the safety circuit will require a reset of the power to the boiler.

10. The burner should be maintained per the Burner Maintenance Section of the Installation Instructions manual.

11. The transformer voltages can be checked with a voltmeter and the values recorded.

12. The High Limit may be checked by, noting all temperature settings, changing the system controller and Dia-Scan II outlet temperature setpoint to a higher setpoint than the limit itself and running the boiler. Allow the boiler to shut down on High Limit. This can be accomplished quicker by having the High Limit set just above the actual outlet temperature indicated on the display. After shutdown, the boiler should not fire up until the ENTER button is depressed and power to the unit is reset. The Dia-Scan II outlet temperature setpoint circuit and the system controller may be tested in a similar fashion but a shutdown on either will not require the power to the boiler to be reset. Return all temperature settings to the original settings upon completion of tests.

13. Safety valves may be checked for proper closure upon loss of flame. The valve should positively stop the flow of gas to the burner within 5 seconds of being de-energized. The voltage to the valve terminals may be checked for loss of power when a flame failure occurs by closing the second manual shutoff valve just ahead of the gas manifold. Plugged leak test valves have been provided on the downstream side of both safety shut-off valves. The leak test valve for the first safety shutoff valve is located on the inlet of the second safety shut-off valve. The leak test valve for the second safety shut-off valve is located in the gas piping between the second safety shut-off valve and the second manual shut-off valve. The plug may be removed to allow a pressure gauge to be inserted to verify proper closure of the valves. The first safety shut-off valve may be checked by energizing

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GENESIS SERIES 200 I.R.I. MODELS (continued)

the vent valve solenoid to close it and closing the manual shut-off valve. The safety shut-off valve should close and the pressure should stabilize. The second safety shut-off valve may be checked while the second manual shut-off valve is closed. De-energize the vent valve and verify that the pressure is stabilized between the second safety shut-off valve and the manual shut-off valve. The pressure should not drop to ensure positive closure. In either case, if a steady change in pressure is indicated, the valve under test should be replaced.

14. The dirt leg and gas strainer (if required) should be inspected periodically for accumulation of foreign debris that could cause blockage. Gas should be shut off ahead of the particular device to be cleaned or inspected to prevent gas leakage.

OPERATING SEQUENCE

The IRI version of the Dia-Scan II Module provides for a single ignition trial or a single flame failure condition before a lockout occurs. An alarm is sounded in the event of a lockout condition. A lockout requires that the power to the boiler be manually reset.

Once the ON/OFF switch closes, all the LEDs on the Dia-Scan II display panel light up temporarily and uninterrupted power is applied to:

A) 120/24 VAC Transformer (Line)
B) Terminal H on LWCO (24 VAC)
C) CN3-P7 on Dia-Scan II module (24VAC).
D) CN3-P6 on Dia-Scan II module (24VAC).
E) CN3-P9 on Dia-Scan II module (24VAC).
F) CN3-P4 on Dia-Scan II module (24VDC).

1. After a few seconds, the outlet temperature is displayed. The System Controller (e.g., tank temperature control, room thermostat, etc.) closes “calling for heat”.

2. This powers CN9-P10 which leads to the Circulating Pump.

3. With the pump operational, the water flow switch contacts close and if the boiler is full of water, the low water cutoff contacts are closed. The unit does a self test of all switches then powers CN9-P4 and the blower is powered up (PRE-PURGE CYCLE BEGINS).

4. If the circulating water temperature is below the outlet water temperature setting, the circuit remains closed.

5. When the gas supply pressure rises above the Low Gas Pressure Switch setting, the contacts close. The High Gas Pressure Switch contacts are normally closed. If the gas valve outlet pressure rises above the set point, the switch contacts will open.

GENESIS SERIES 200 I.R.I. MODELS (continued)

6. The Blocked Flue Switch contacts are normally closed. If the exhaust vent pipe is blocked, the switch contacts will open. The Blocked Intake Air Switch is normally closed. If the inlet is blocked, the switch contacts will open. The Blower Prover Switch is normally open. Blower operation will close switch.

7. Once the pre-purge cycle ends and with all switches operational, CN4-P3 is energized and the igniter goes into the warm-up/proving period (the Igniter should begin to glow).

8. After the Igniter current reaches a preset amperage, the Dia-Scan II module senses that the position indicating switches are in the correct initial state and the gas valves are then powered. The position indicator switches on the gas valve change states and the CN7A-P1 contacts are energized. The warm-up/proving period ends and Trial for Ignition (TFI) begins.

9. The Igniter ignites the incoming gas mixture. Upon proof of flame the igniter is shut-off and the Flame Sensor monitors the continued presence of flame.

   A) If the flame is sensed by the Flame Sensor, power to the igniter is disconnected, the glow diminishes and the flame remains on.

   B) If the flame is not sensed during the TFI period, the system will go into lockout sounding an alarm (blower and pump will shut down). A manual reset of power to the unit is required in order to restart the boiler.

10. Should any switch interrupt the unit's operation, the CN7A-P4 is de-energized closing the gas valves and extinguishing the flame. The post purge cycle begins and the Pump and Blower remain on for approximately 45 seconds until the post purge cycle ends.

    A) If the flame was extinguished due to the System Controller or outlet temperature setpoint circuit becoming satisfied, the boiler goes into “standby” awaiting the next “call for heat”.

    B) If the flame was extinguished for any other reason, the boiler will go into lockout and sound an alarm. A manual reset of the power to the boiler will be required in order to initiate a new ignition sequence.

    C) If the flame was extinguished due to the High Limit, the boiler will go into lockout and sound an alarm. Depressing the ENTER button on the Dia-Scan II display panel as well as resetting of the power to the boiler is required in order to initiate a new ignition sequence.

Visit the "Information Central" link of
www.hotwater.com for a listing of
available Service Handbooks.

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